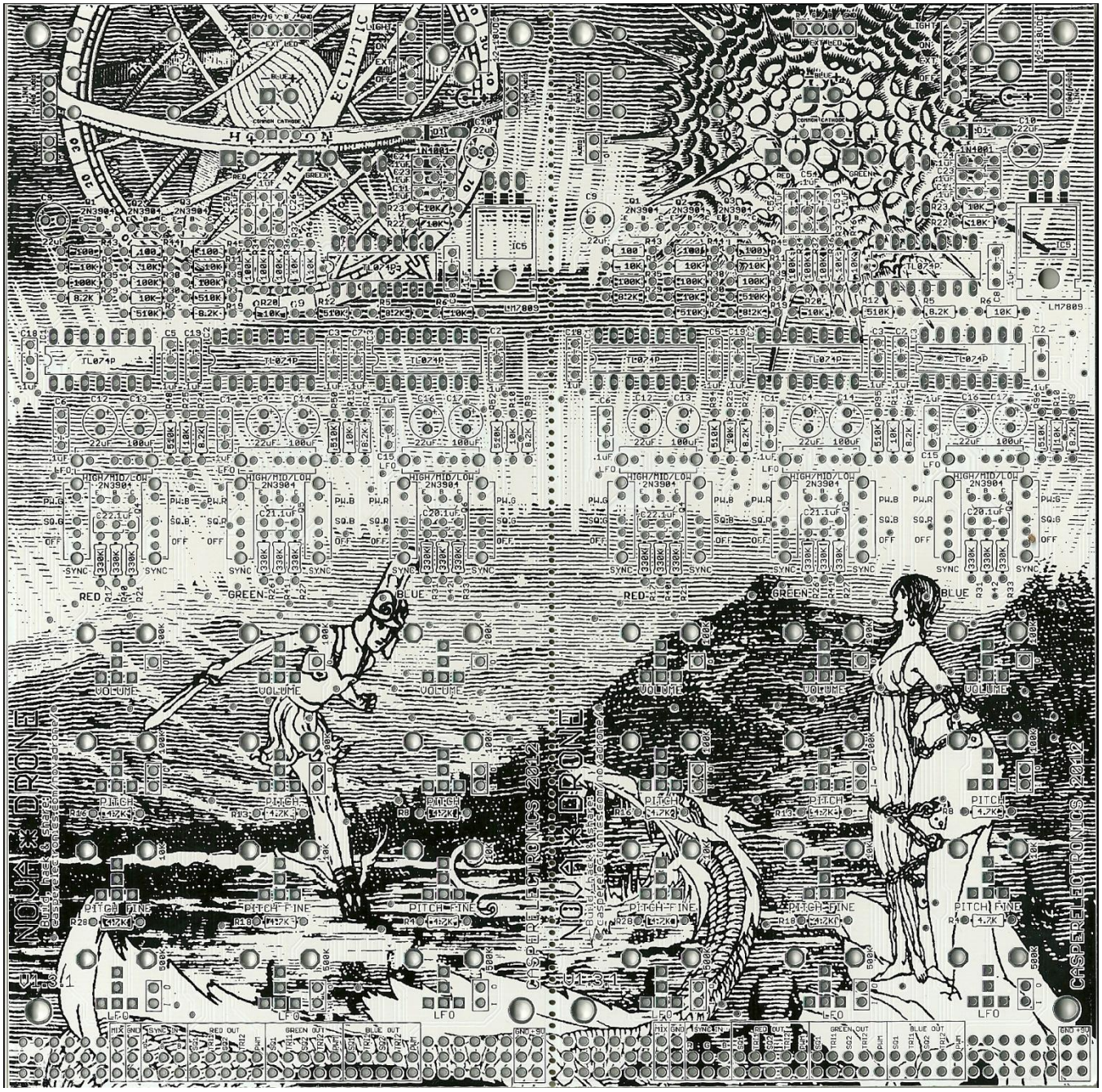
THE NOVA DRONE

v 1.3.1

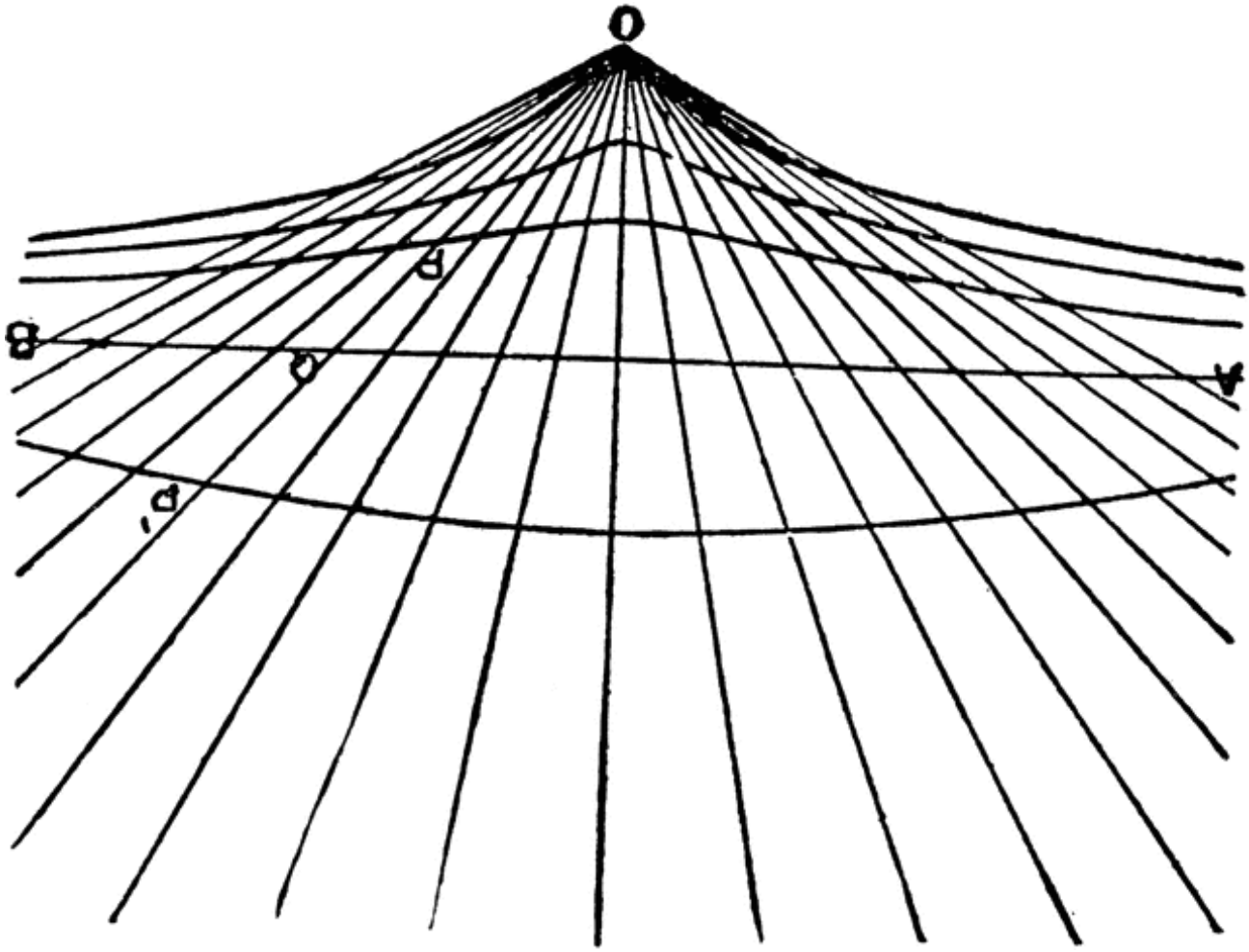
ASSEMBLY MANUAL



Part I: Parts Kit

Part II: Tools and Technique

Part III: PCB Assembly

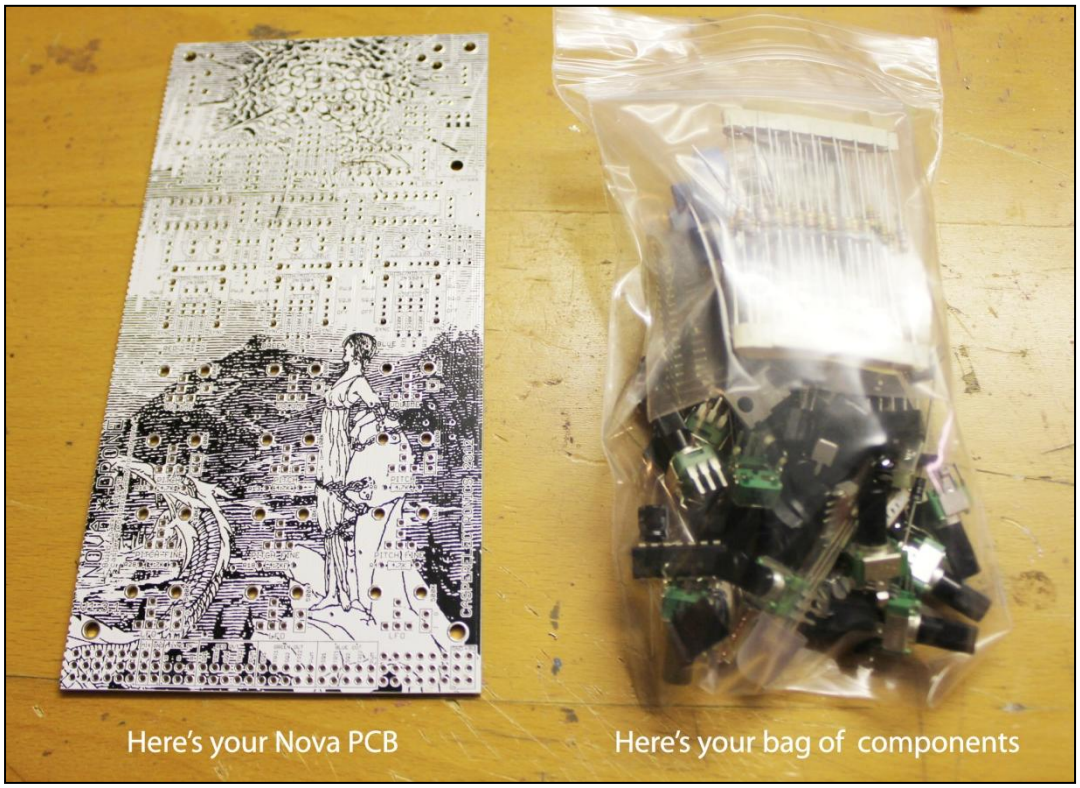


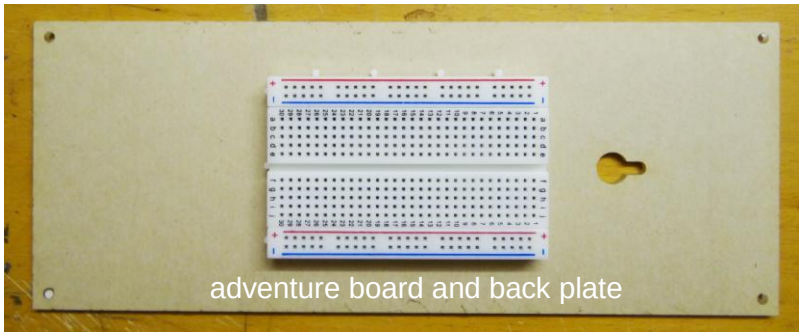
PART I: PARTS KIT

Your parts kit comes with everything you need to assemble and experiment with the NovaDrone.

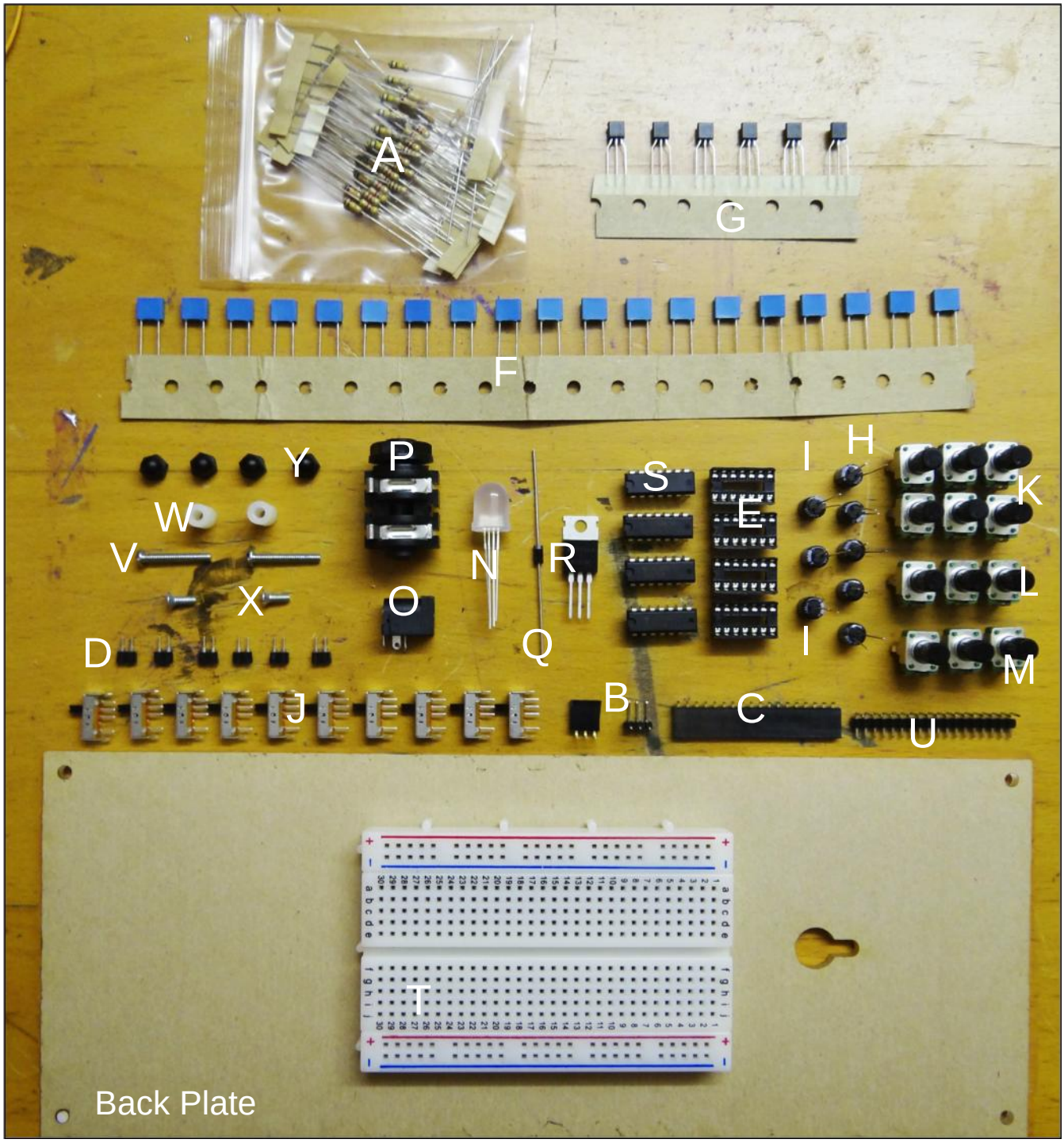
In your parts kit you will find:
-1 PCB (printed circuit board)
-1 plexi glass back plate (the one shown in the following tutorial is hard fiber board).
-1 bag of electrical components. The contents of the component bag are detailed below.

Check all of your parts BEFORE you begin assembly to make sure you have everything.





Here are all the contents of the components bag……

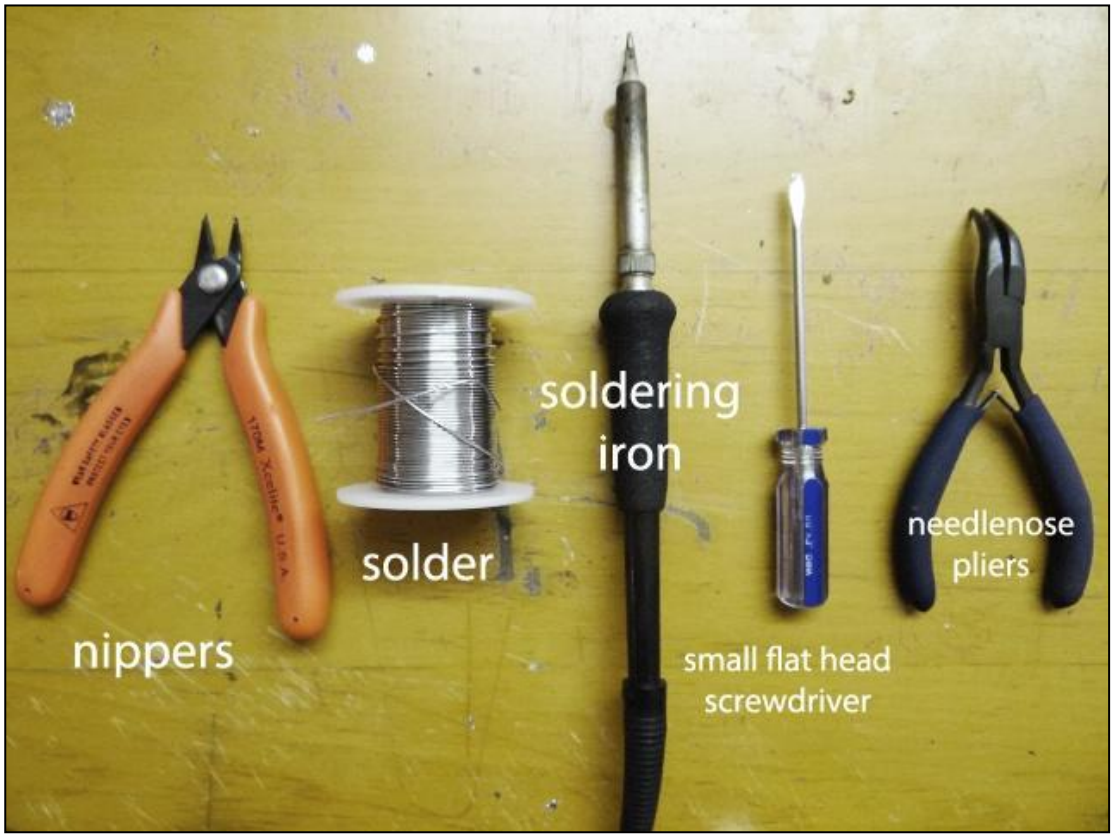


Below is a list of all the components you will be installing in the order you will install them.

A) Resistors
    - (3) 100 ohm
    - (6) 4.7k
    - (6) 8.2k
    - (13) 10k
    - (6) 100k
    - (9) 330k
    - (6) 510k
B) Male and Female Link Headers
C) Female Adventure Header
D) (6) Straight Headers
E) (4) IC Sockets
F) (19) .1uF Capacitors
G) (6) 2N3904 Transistors
H) (5) 22uF Capacitors
I) (3) 100uF Capacitor
J) (10) Switches
K) (6) 100k pots
L) (3) 10k pots
M) (3) 500k pots
N) (1) 10mm common anode LED
O) 2.5mm pin power jack
P) ¼" switching audio jack
Q) 1N4001rectifier diode
R) LM7809 9 volt DC voltage regulator
S) (4) TL074 quad op-amp ICs
T) Adventure board
U) Male adventure board header
V) (2) ¾" machine screw
W) (2) 3/8" nylon spacer
X) (2) ¼" flat head machine screw
Y) (4) Nylon "acorn" machine nut / housing feet
Z) Adventure kit
    - (2) Light sensors
    - (4) LEDs
    - (2) 100uf Capacitors
    - (2) wire jumpers

PART II: Tools and Technique

Here are all the tools you will need for assembly



Wire nippers: These are used to clip the ends off of the component leads after you solder them in place.

Solder: You can use any kind of solder you like but its best to use a fine “no clean” solder. If you use *generic* solder like the kind sold at radio shack you can be pretty sure it is a no clean variety. We use .032” 60/40 rosin core solder.

Soldering Iron: This is one of the most important tools in your workshop. I use a Weller brand WES51soldering station. The WLC100 is a nice alternative at about half the price.

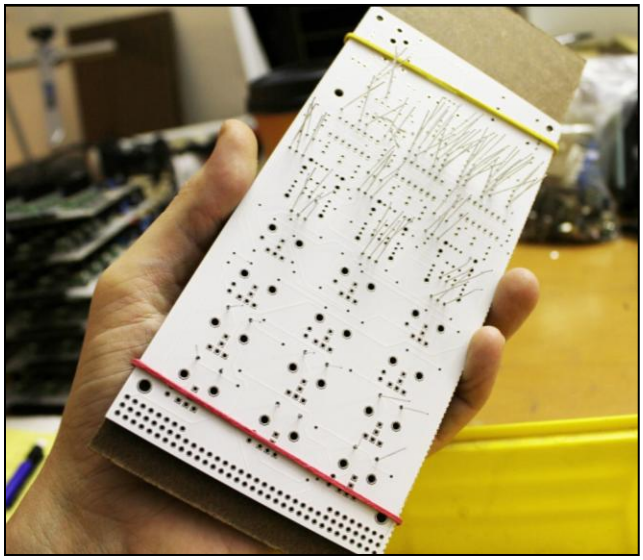
If you’re new to the soldering game, here’s a link to a bunch of helpful soldering tutorials:

http://www.ladyada.net/learn/soldering/thm.html

Small Flat head screwdriver: this will be vary useful for prying up and pressing down components at various stages of assembly, such as the ICs and header leads. Its also useful for tightening the back plate hardware

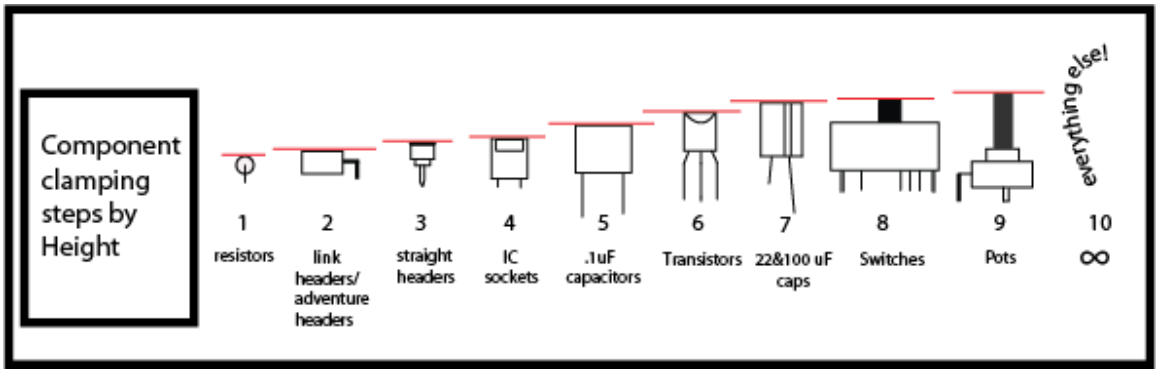
Needle-nose pliers: These will be useful for bending and are generally good to have around.

THE MIRACLE OF CLAMPING

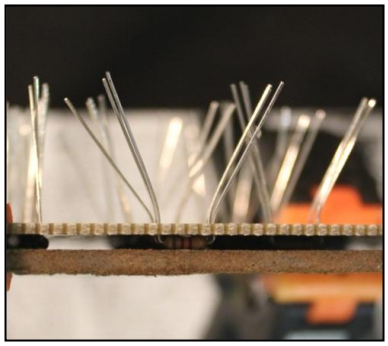


Clamping is a method of assembly which will save you a ton of time and is easy to do BUT it requires you assemble the NovaDrone in a particular order so PLEASE read the instructions below!

Basically you will place all components of the same height into the PCB and clamp them in place using the back plate and the provided rubber bands. Then you can flip the board and all components are held tightly in place. This will save you a lot of time. It also helps hold tricky components (like the slide switches) in place.



1. Populate the PCB with components of the same height (order shown above)
2. Place the back plate on top of the components
3. Use the Rubber Bands to clamp the Back Plate to the PCB
4. Flip the Clamped PCB over
5. Check the profile of your components to make sure they are clamped tight to the board.
6. Solder all the leads
7. Remove back plate
8. Clip off the soldered leads
9. Move to the next tallest components and repeat

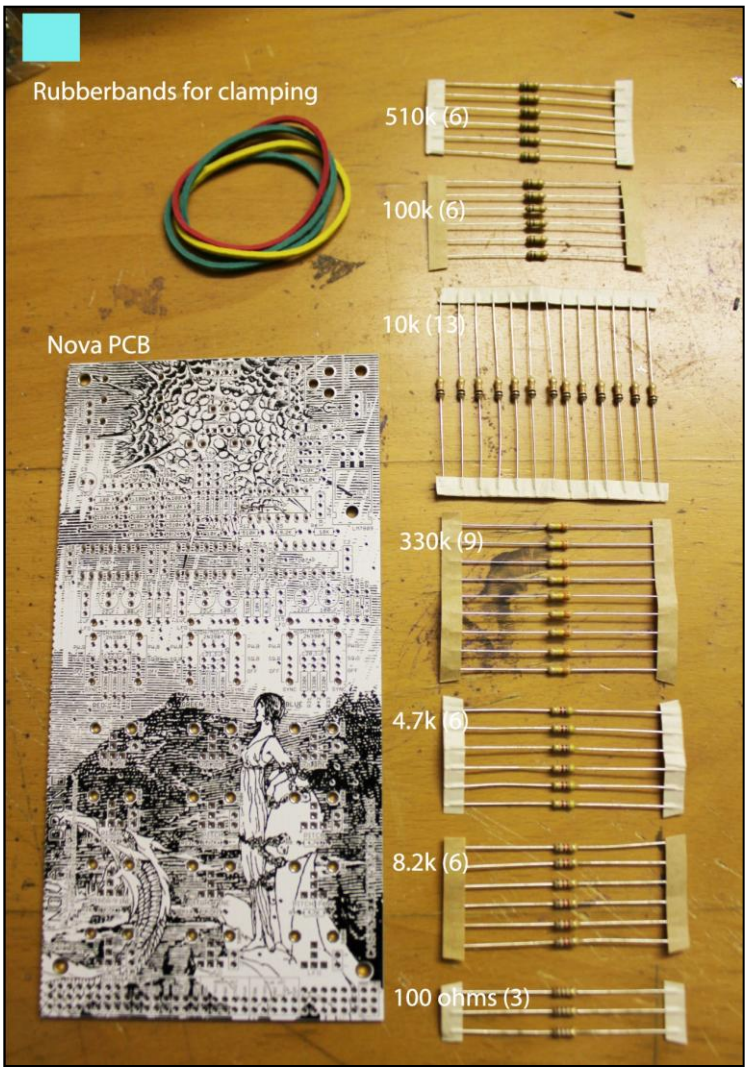


PART III: PCB ASSEMBLY

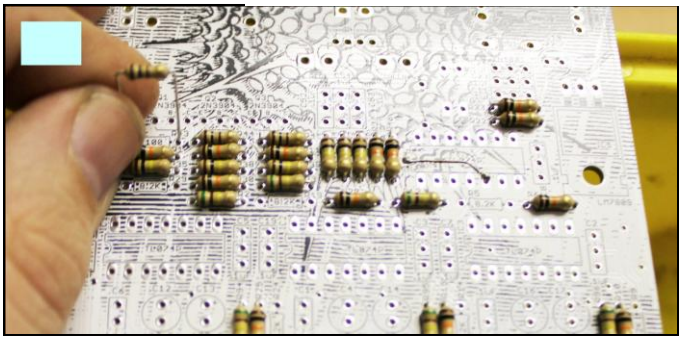
We will be assembling the PCB in the following order

1. Resistors
2. Connection headers
3. Modulation headers
4. IC sockets
5. .1uF caps
6. Transistors
7. 22&100uF Caps
8. Switches
9. Pots
10. Remaining hardware (LED, regulator, rectifier, audio and power jacks)
11. Adventure board
12. Back plate

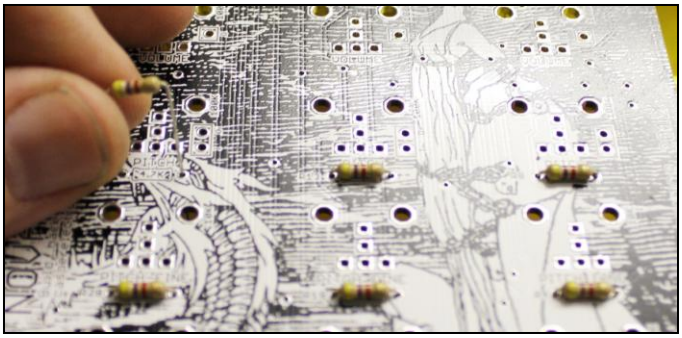
1: RESISTORS



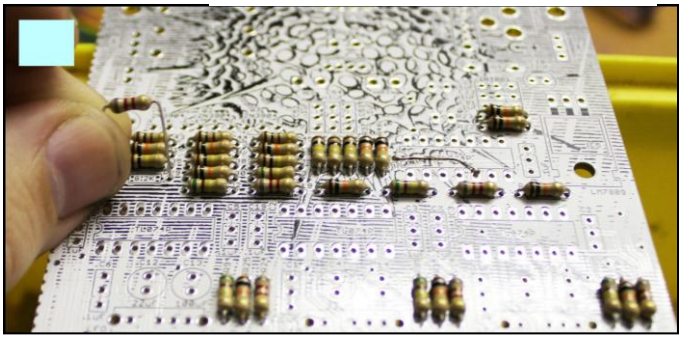
100Ω (3)



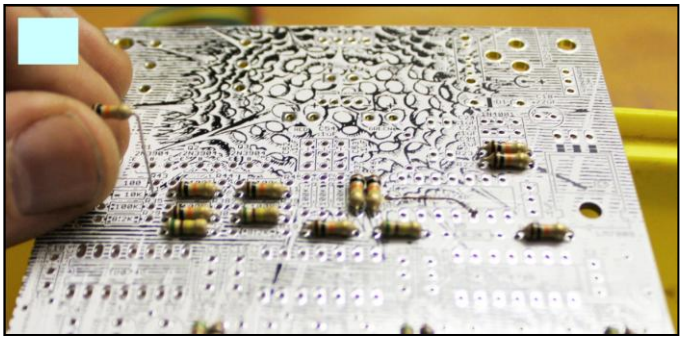
4.7k (6)



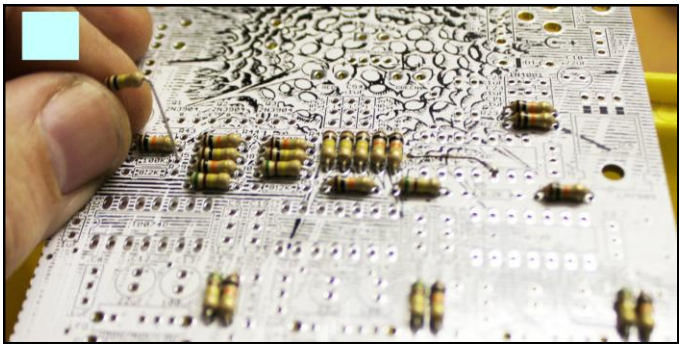
8.2k (6)



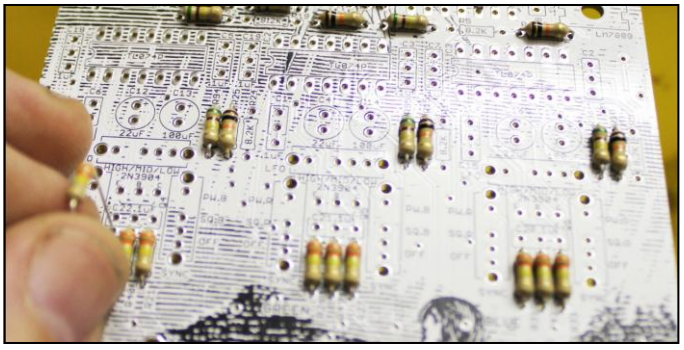
10k (13)



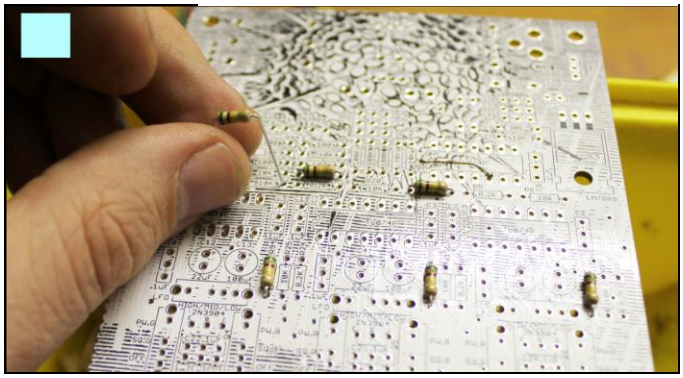
100k (6)

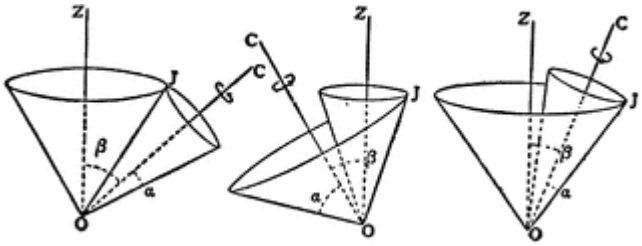


330k (9)

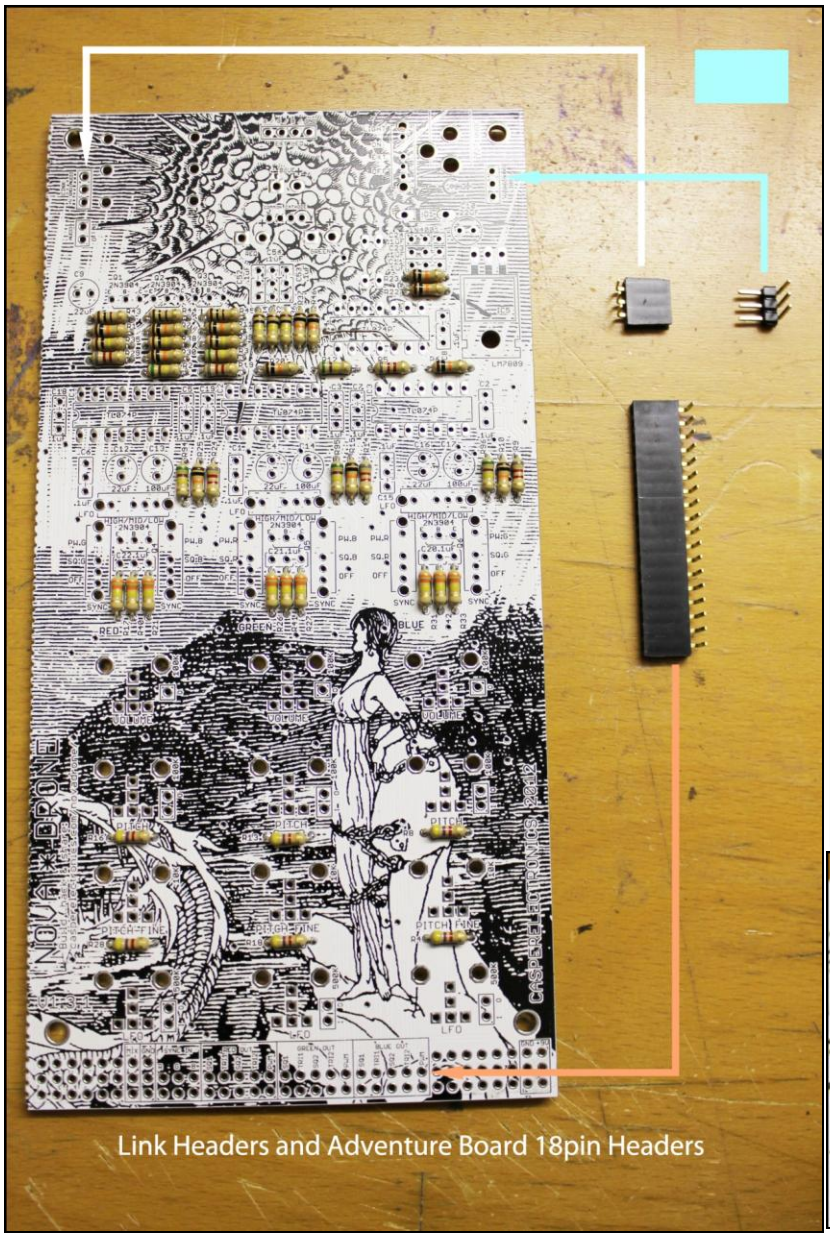


510k (6)

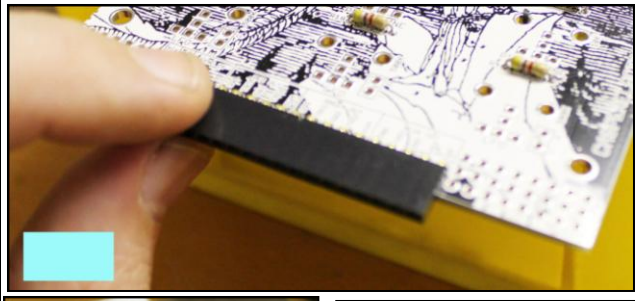


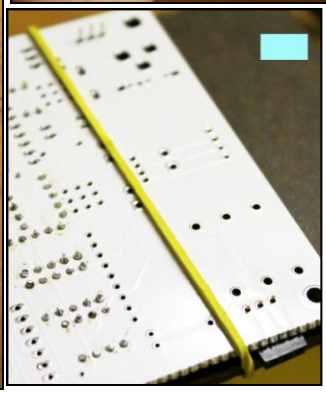


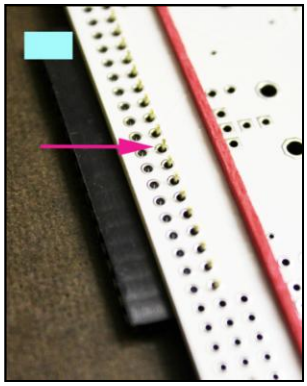
2: CONNECTION HEADERS



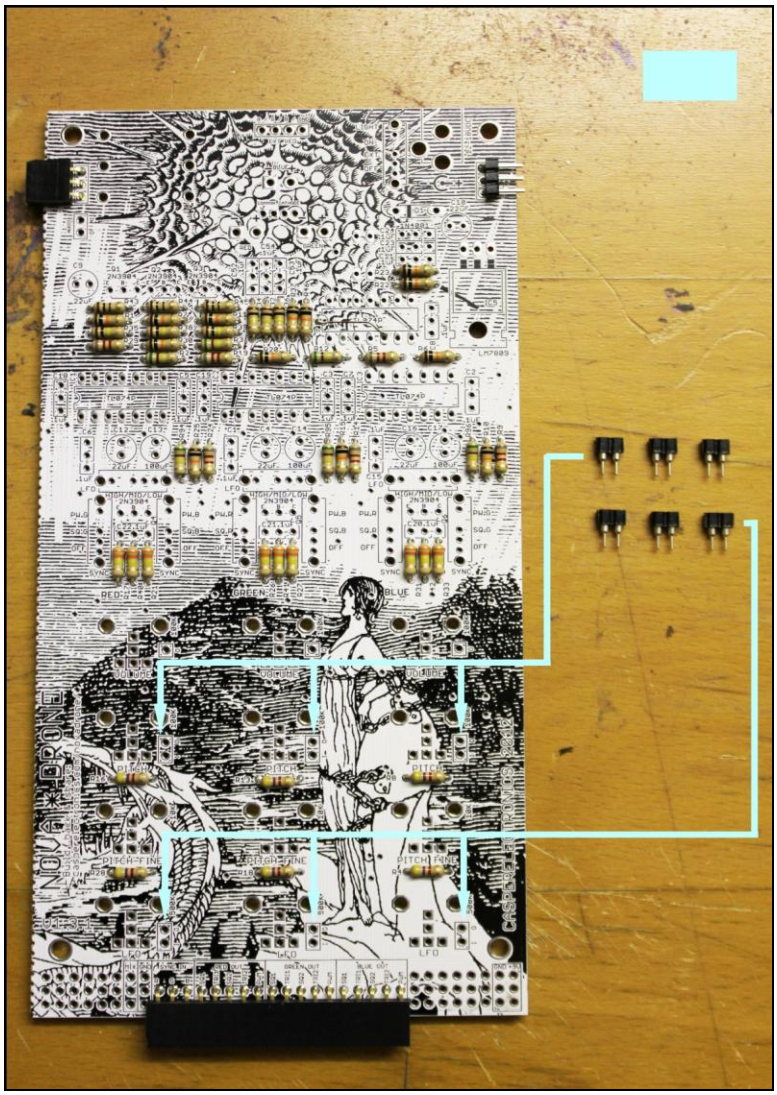
Make sure to install the male 3 pin and large female header as shown below. They are VERY difficult to fix if done incorrectly. The 3 pin header should be installed so the metal legs come out of the plastic foot parallel to the PCB. The large header should be installed in the second row in.

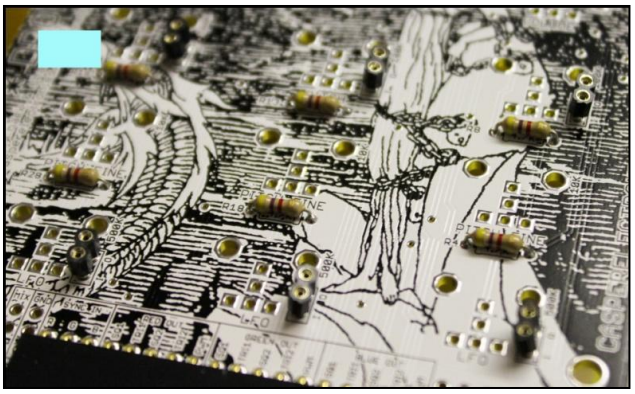




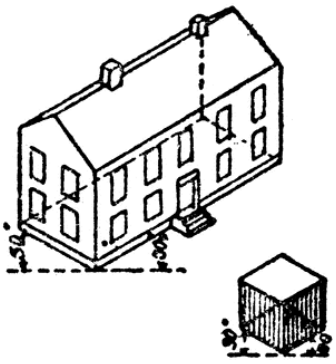


3: MODULATION HEADERS

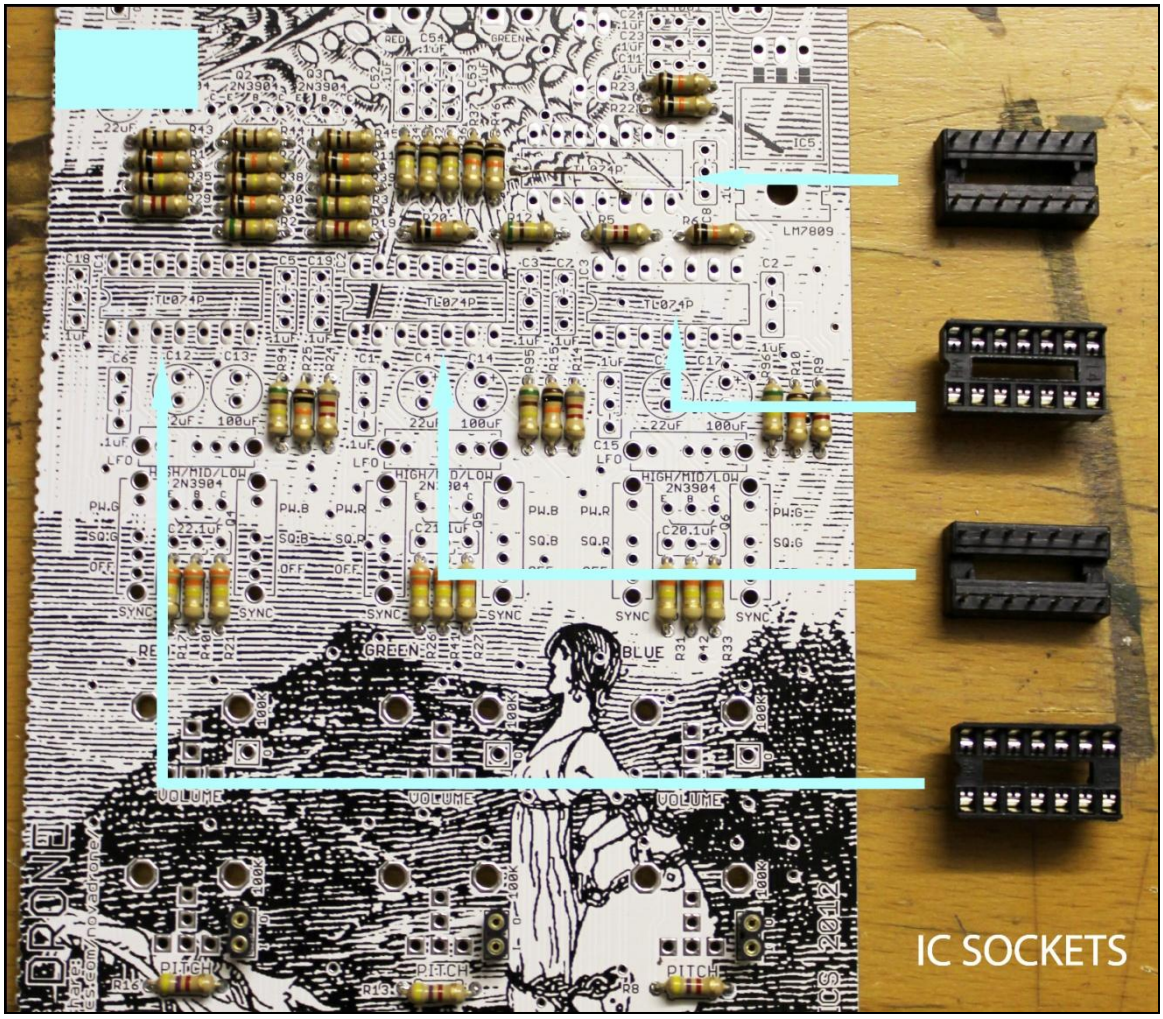


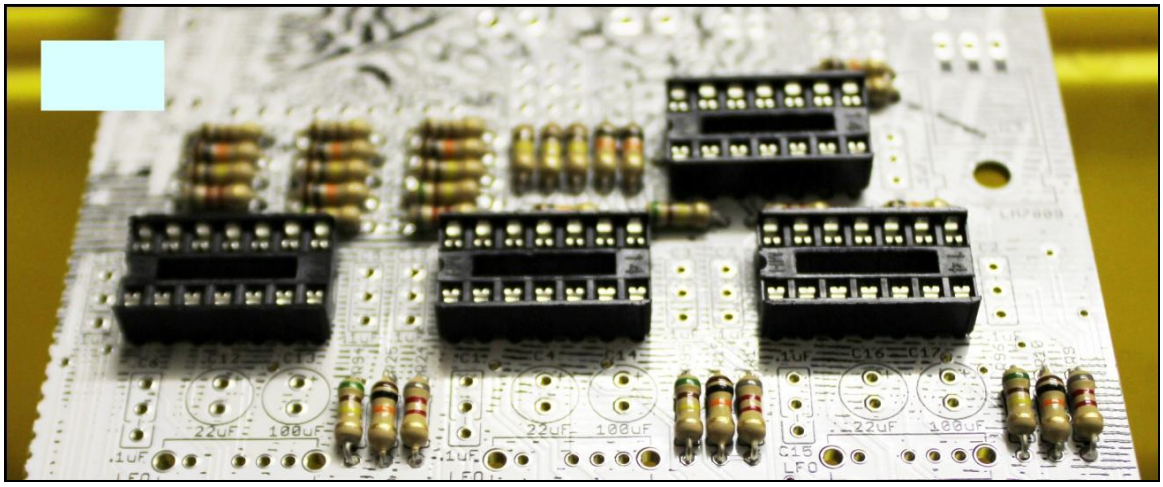


These headers allow you to patch into the rate controls for the oscillators and LFOs. For instance plugging the provided light sensors into these sockets will allow you to control the rates with light.

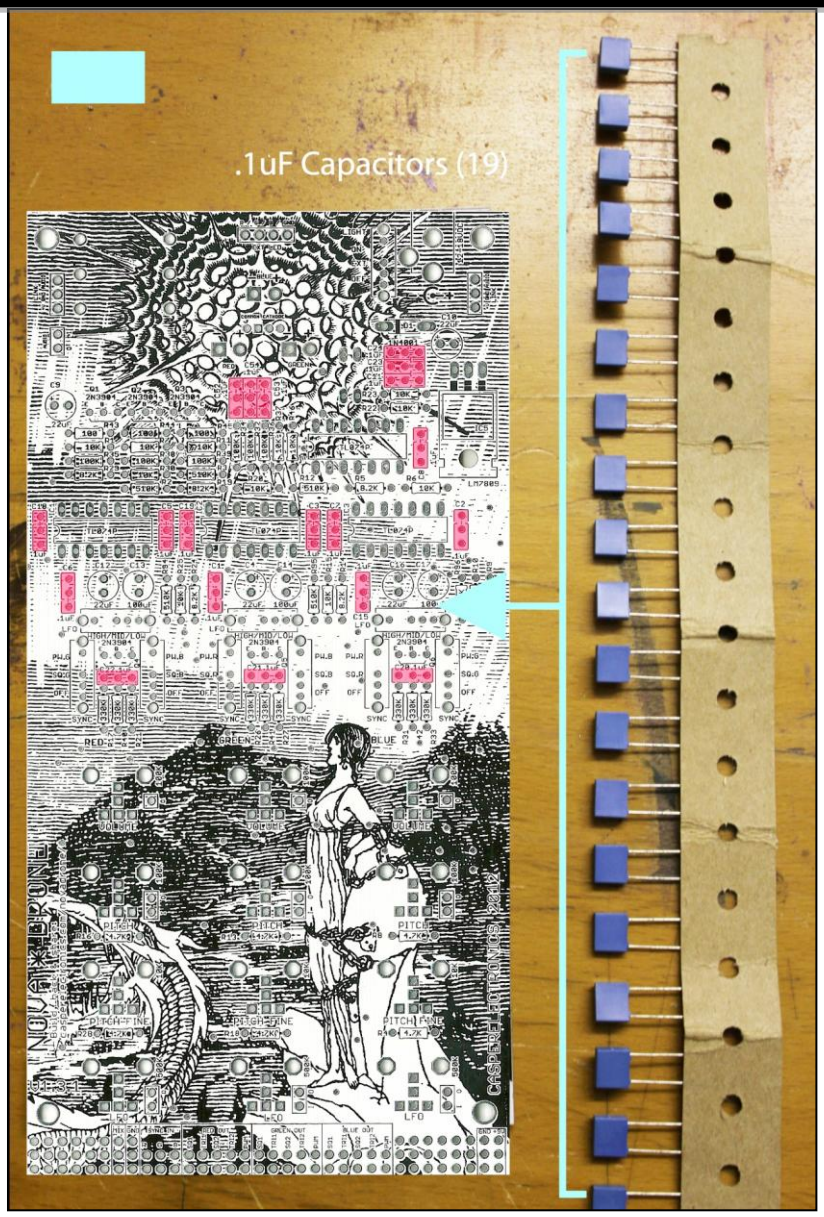


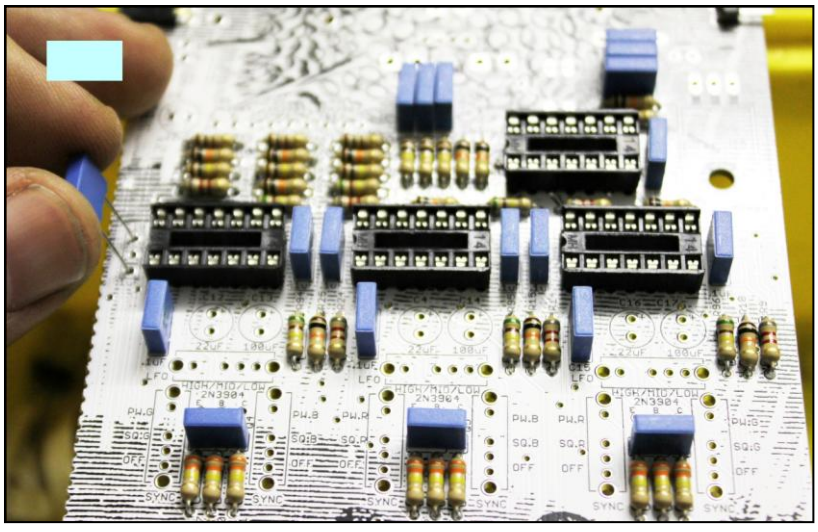
4: IC SOCKETS





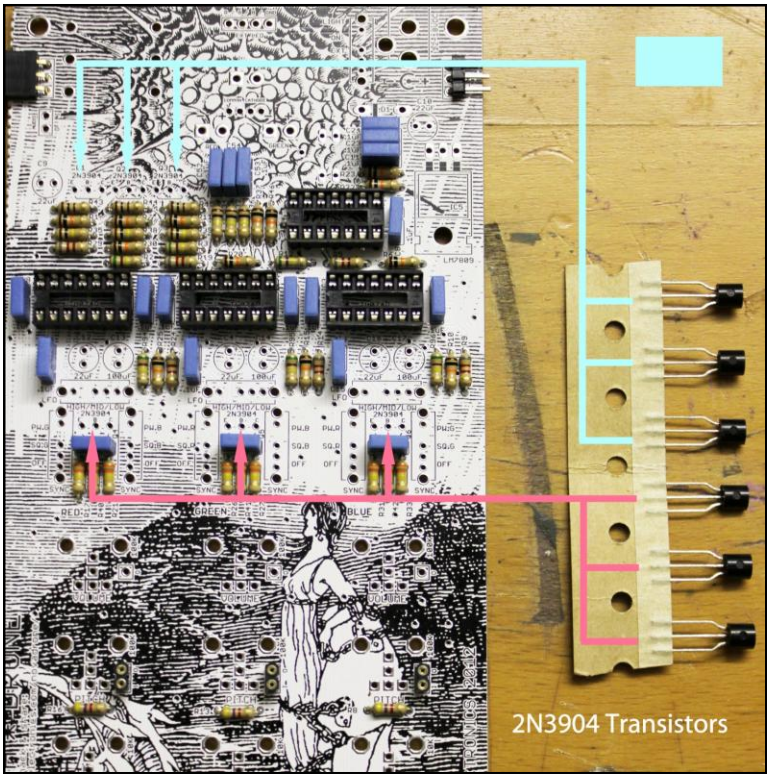
5: .1uF CAPACITORS

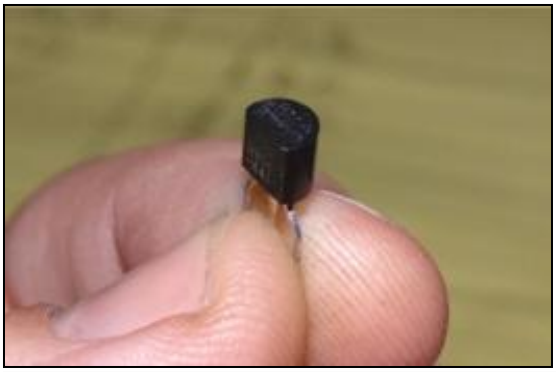


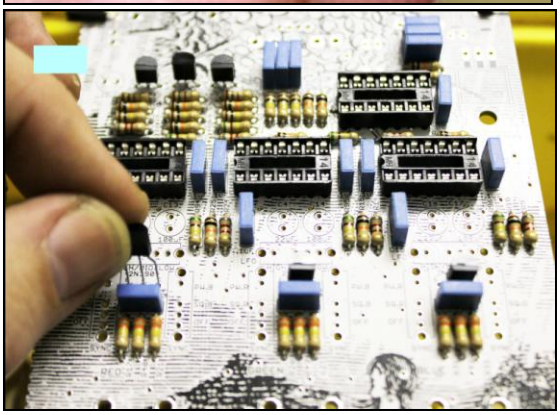


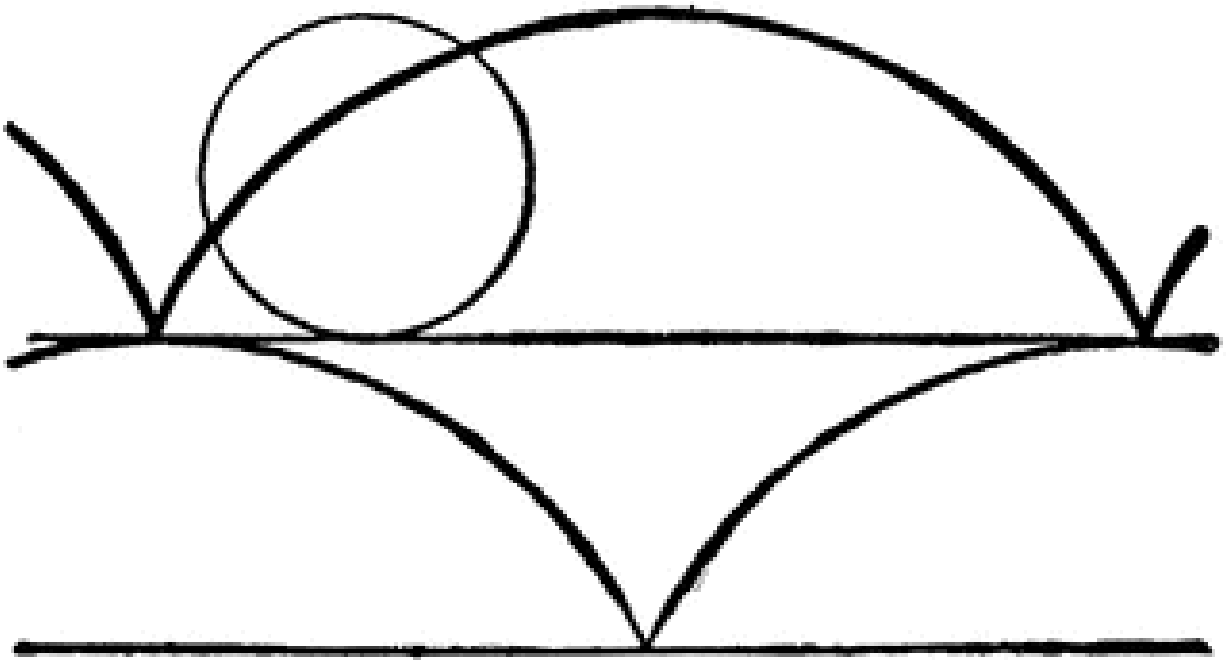
6: TRANSISTORS

NOTE: Transistors are polarized. Make sure they are installed correctly with the flat side pointing down.



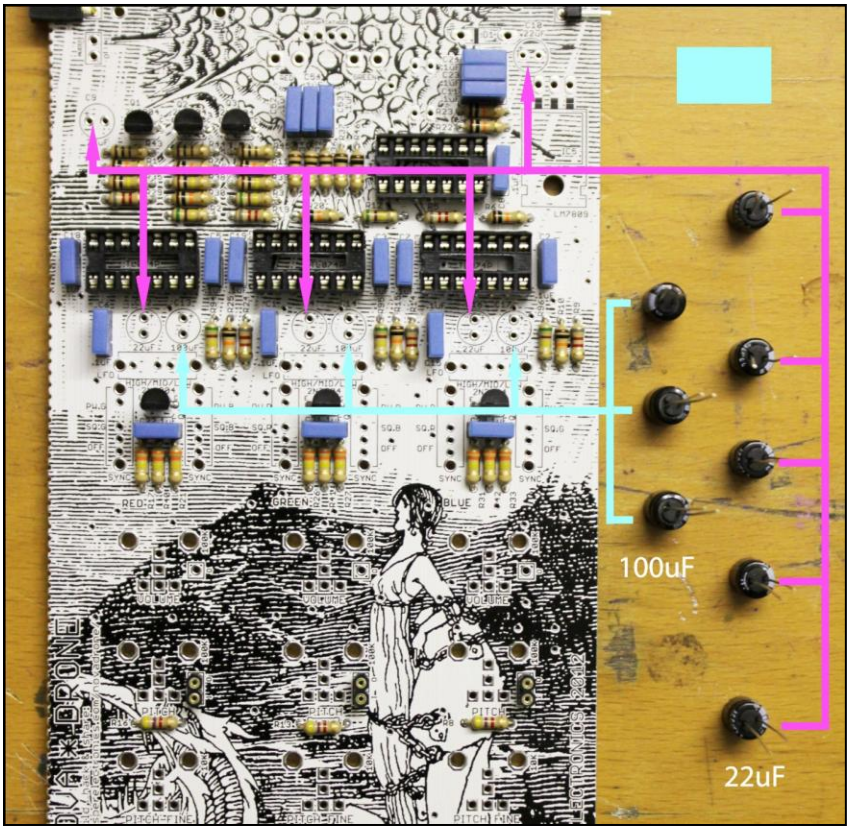


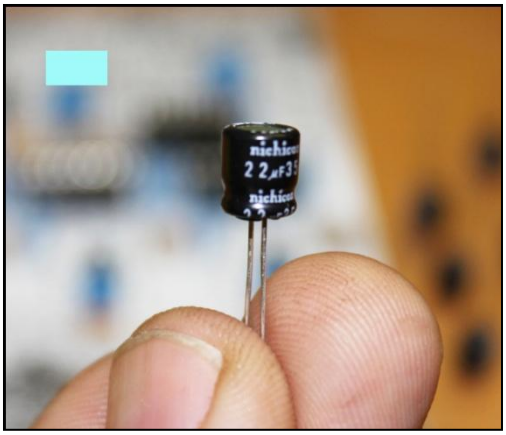


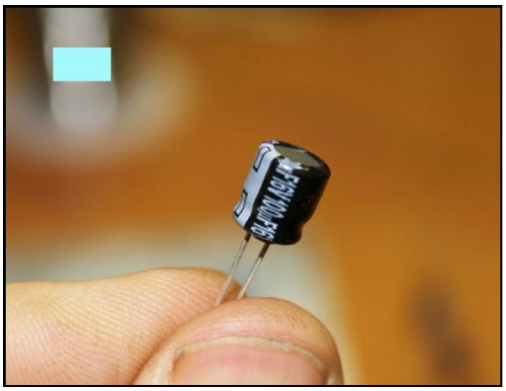


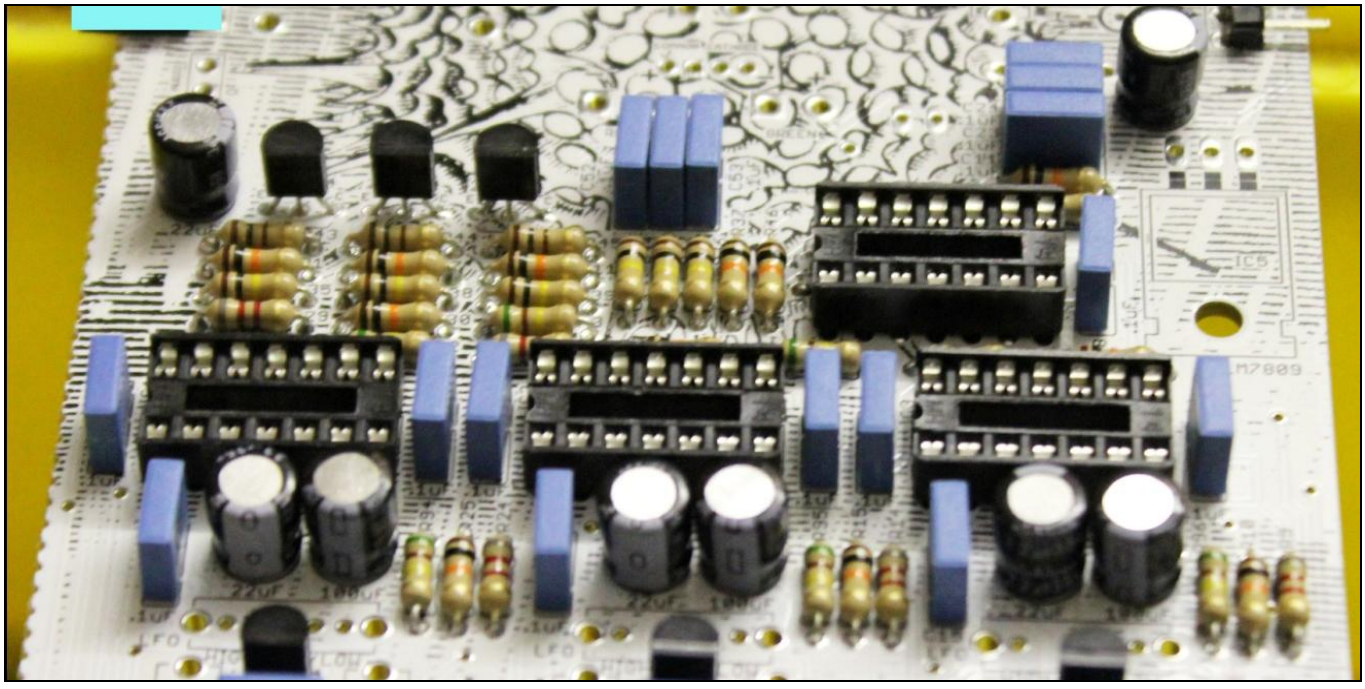
7: 22uF and 100uF CAPACITORS

NOTE: These capacitors are polarized and must be placed in correctly. The positive leg of the capacitor is marked on the board with a small “+”. The negative leg of the capacitor is marked on the cap housing with a line of “-“ marks. Also notice that the 20 and 100uF caps look very similar. The value of each cap is



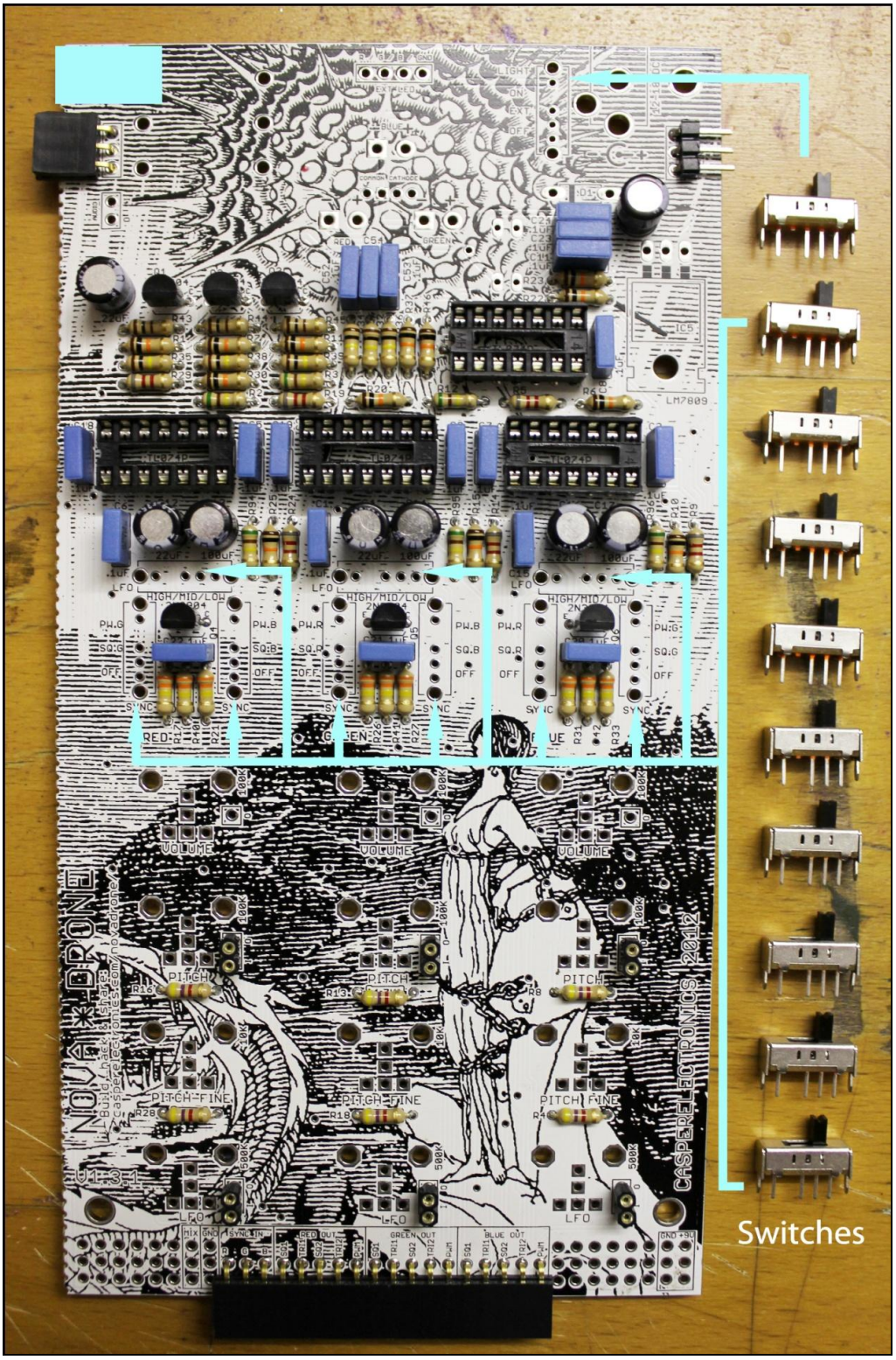


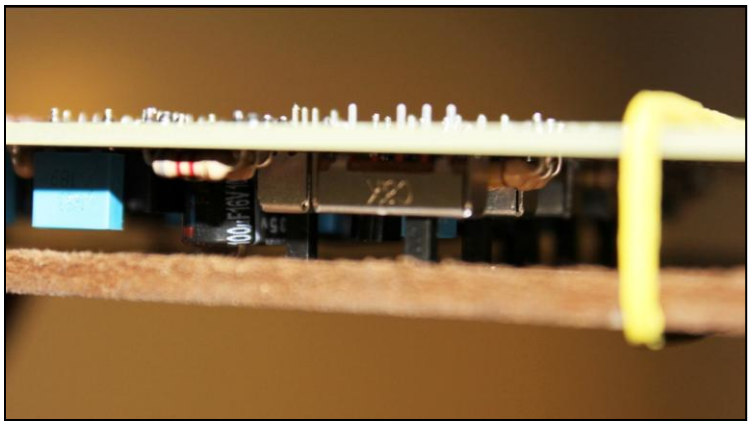




8: SWITCHES

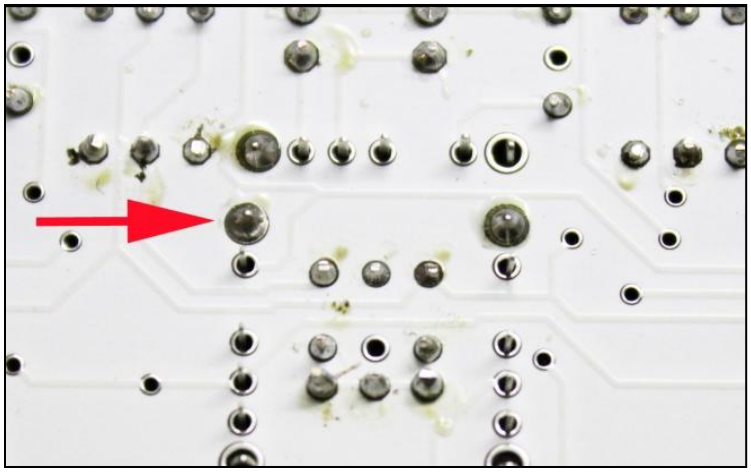
NOTE: The switches can be a little tricky to install correctly. Please read the installation instructions below



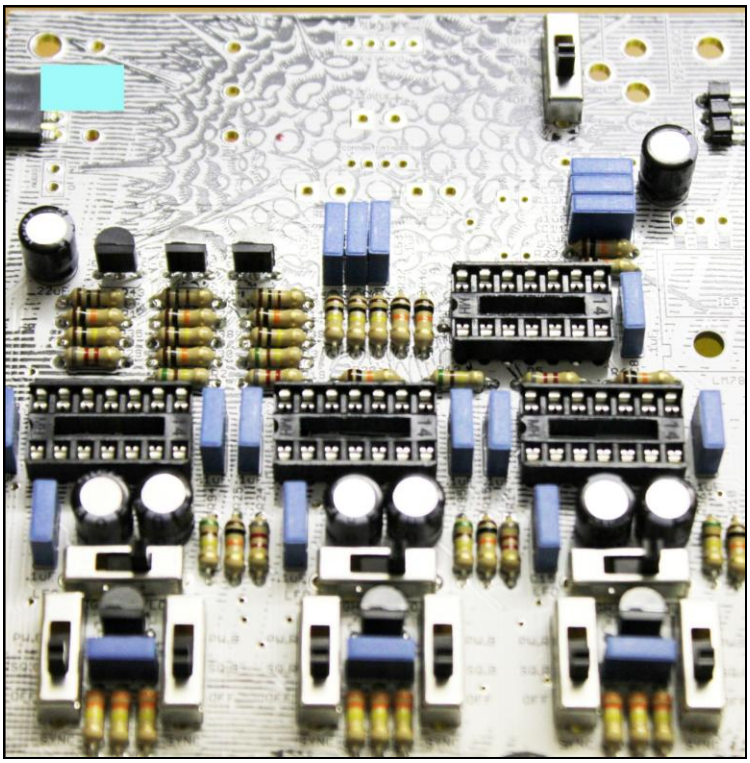


The switches fit a little loosely into the board and have a tendency to move before you are finished soldering them in place. Once the switches are fully installed it is nearly impossible to reposition or remove the switch without destroying it, so take your time on this step.

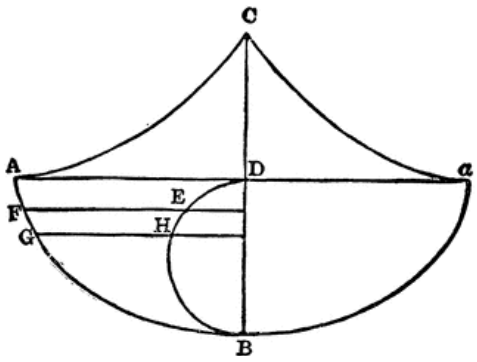
The first step is to clamp your switches in place and then look carefully from the side to see if any of them are in crooked.



Then solder JUST ONE solder point on EACH switch. Remove the clamp and back plate and flip the board over. Double check to see if the switches are in straight. If there is a problem simply melt the solder on the single point and reposition the switch.

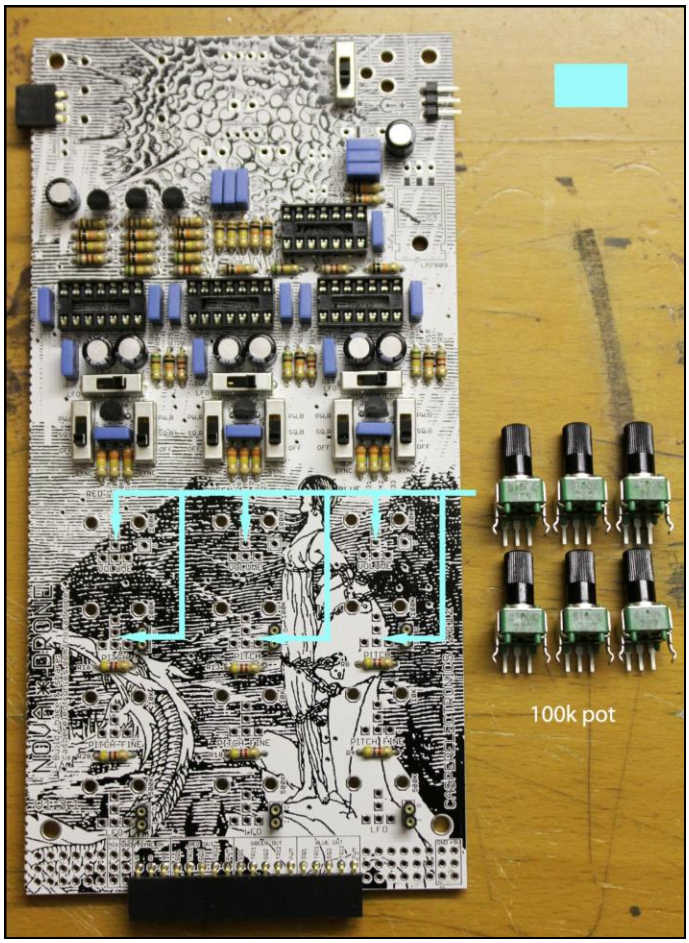


If everything looks good, finish soldering all 6 of the solder points on the switches

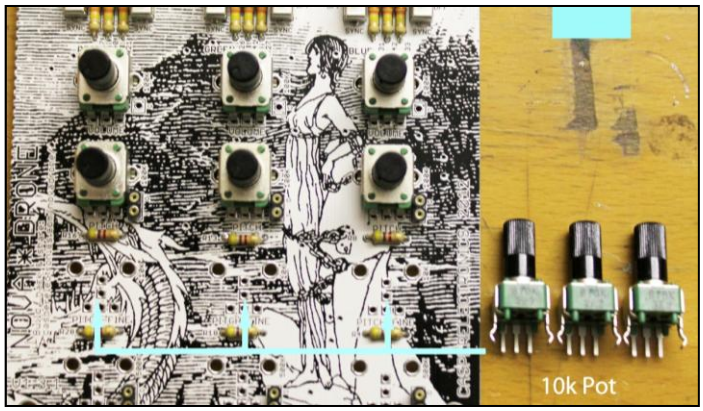


9: POTENTIOMETERS

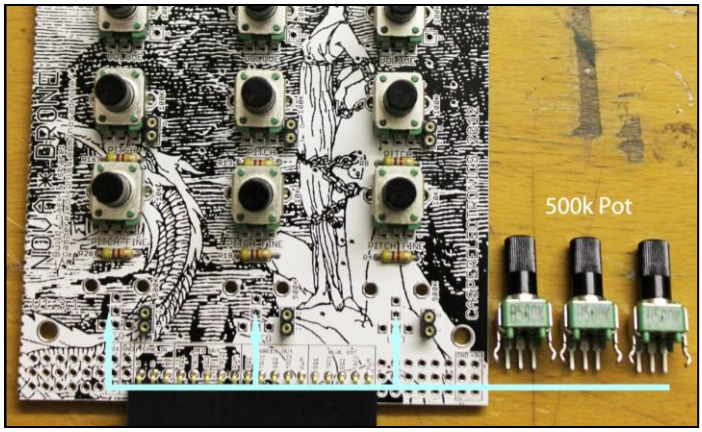
(3) 100k pots



(3) 10k pots



(3) 500k pots

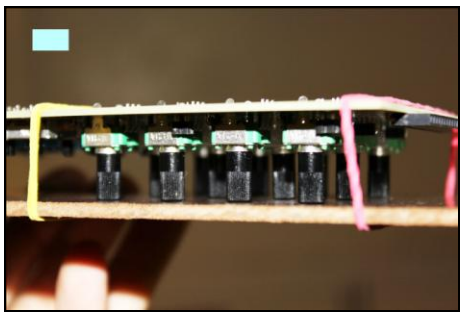


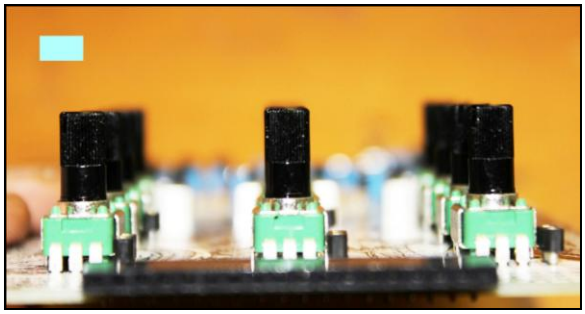
Just like the switches, the pots take a little care and patience to install correctly. Clamp the pots in place and look closely to see if they are in straight.

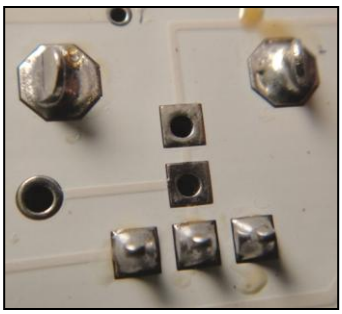
Solder one leg and remove the back plate. Look at the pots to see that they all line up evenly.

.

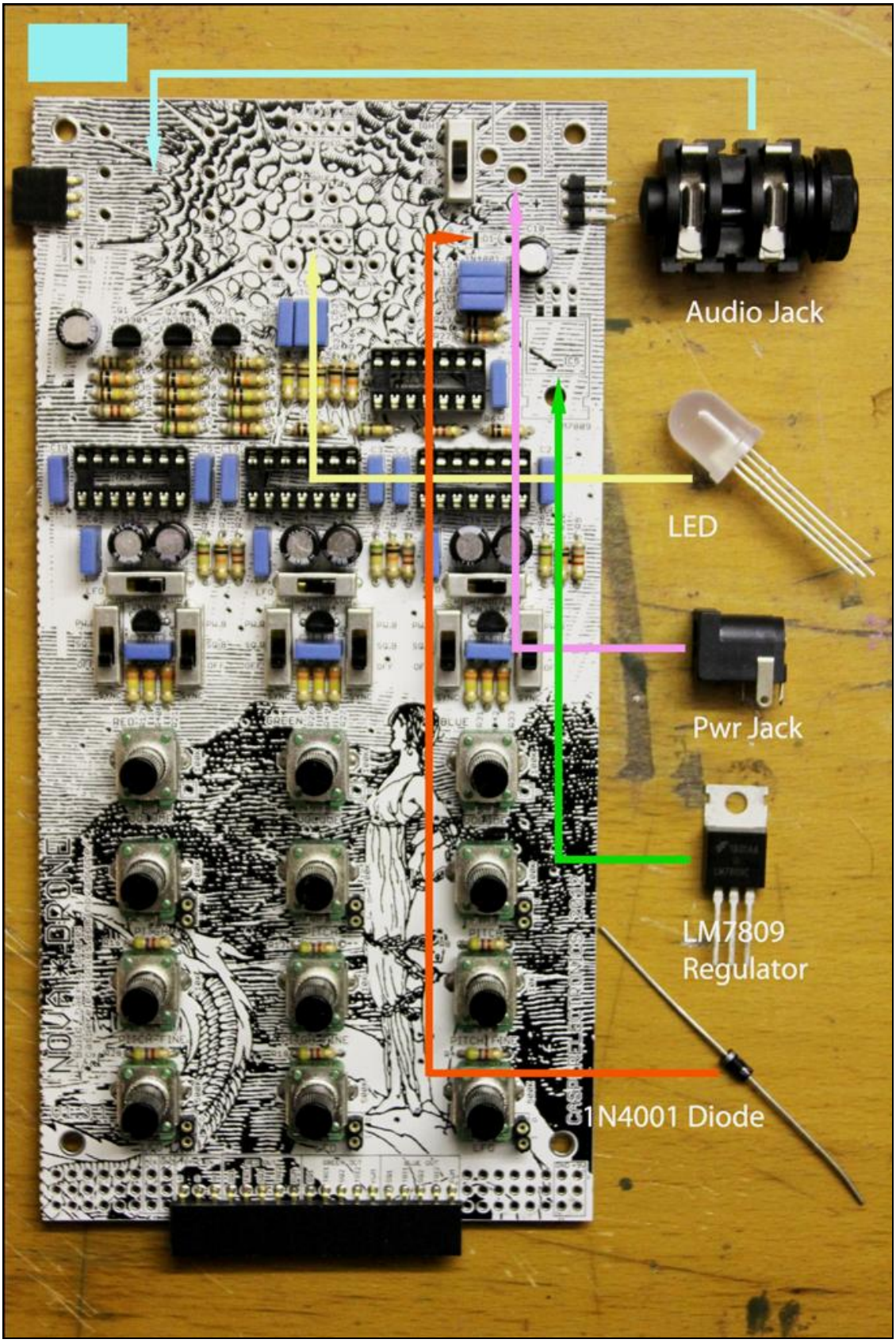
Once they look good, finish soldering the 5 legs. Make sure the two large legs are completely soldered in place. Apply JUST enough solder to fill the hole that the legs poke through.







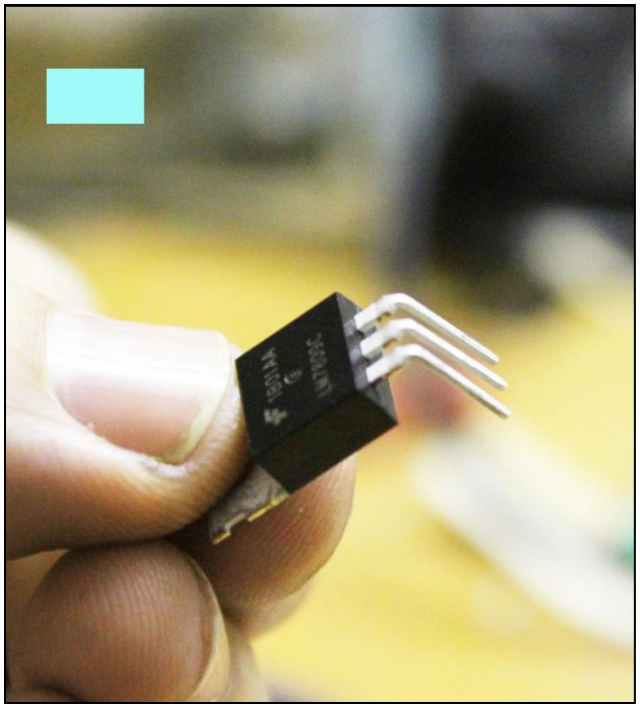
10: REMAINING HARDWARE

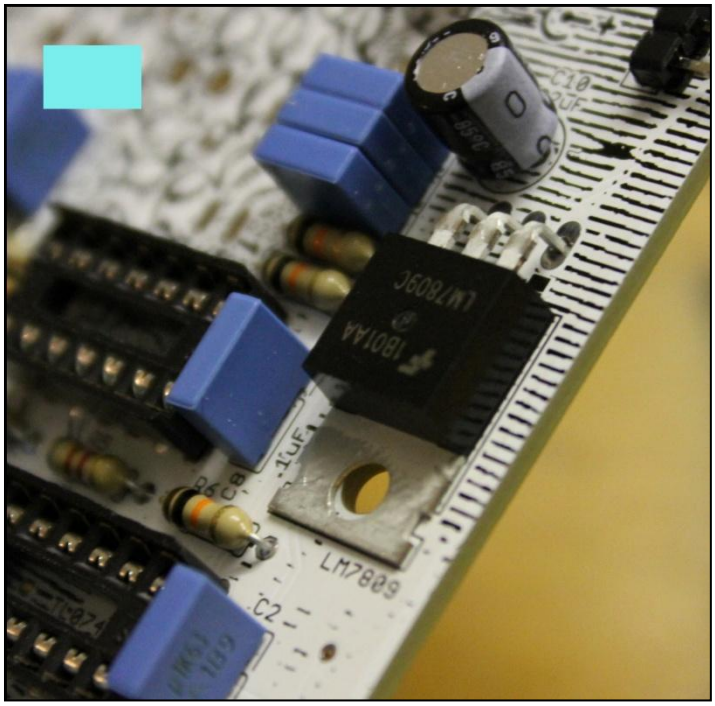


The final components are installed one at a time and will **not** be clamped in place. Each requires some special attention which is outlined below.

LM7809 voltage regulator

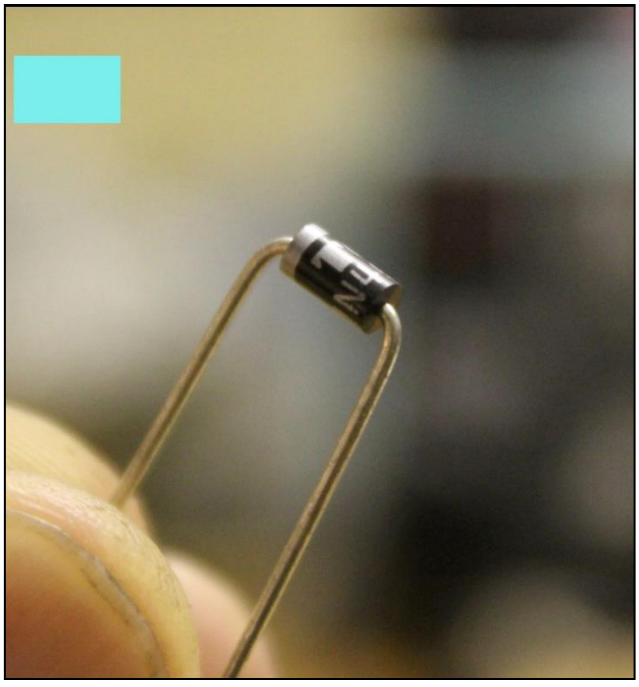
Bend the LM7809 regulator leads at a right angle with pliers, and place in the board.

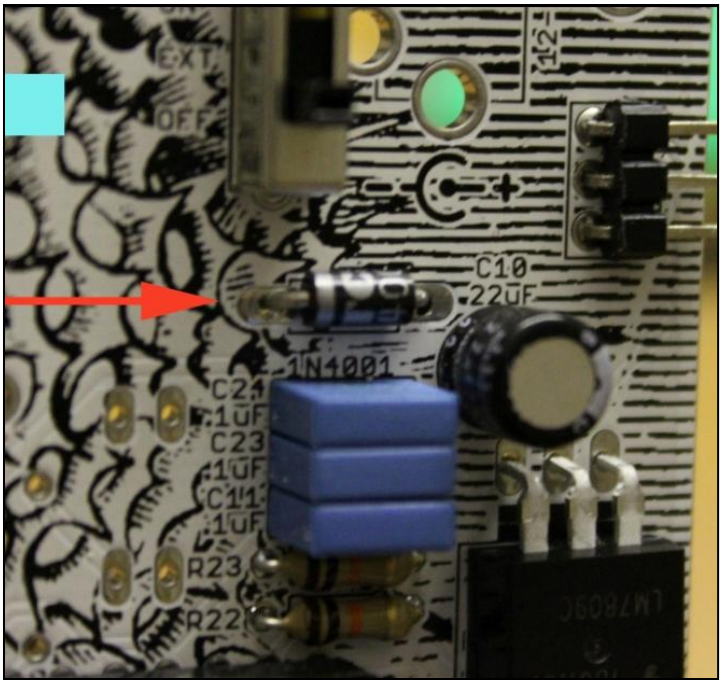




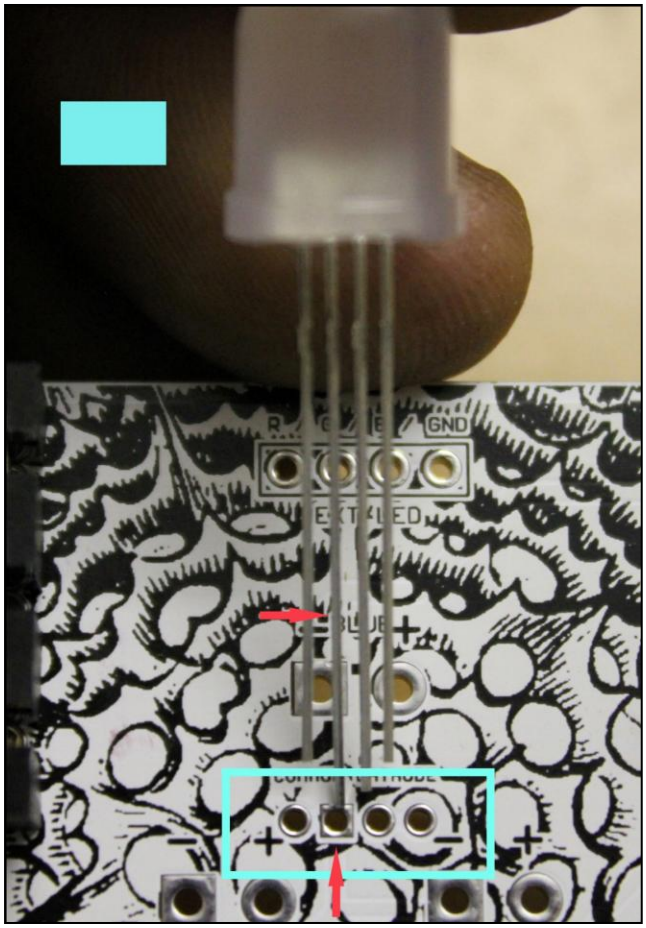
1N4001 rectifier

NOTE: the rectifier is polarized and must be installed as shown below.

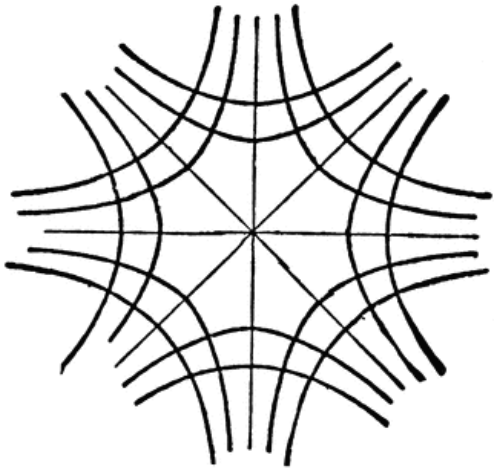




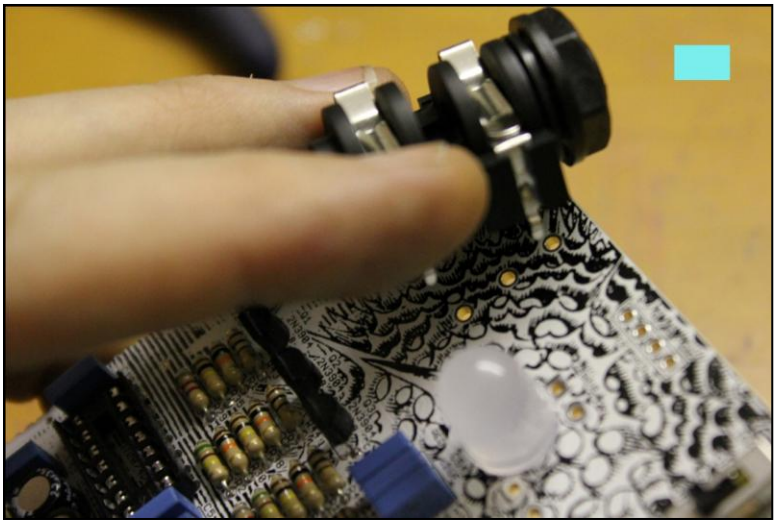
Tri-color LED

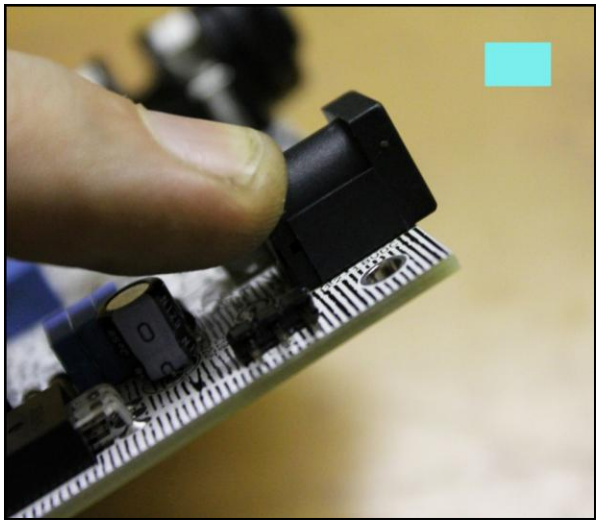


NOTE: The LED is polarized and must be installed correctly. As seen in the image to the left, the four leads of the LED have different lengths. You must place the LONGEST lead in the **SQUARE hole**.



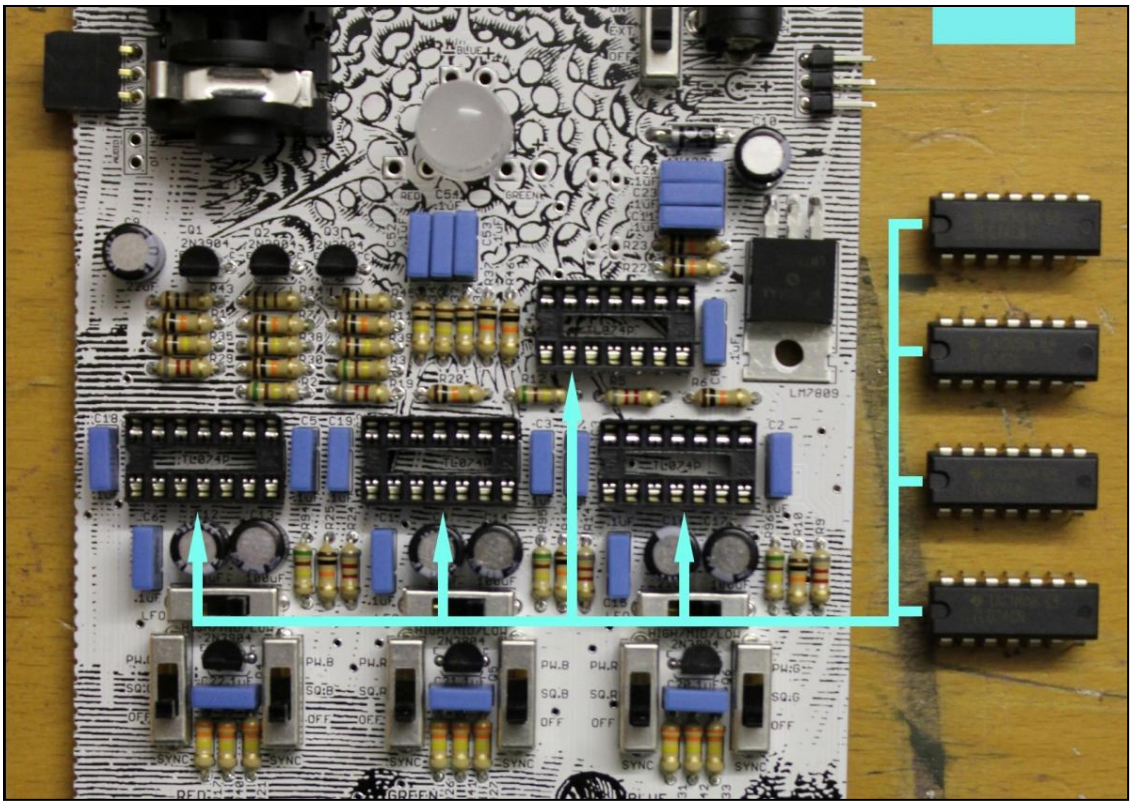
¼" audio jack & DC power jack

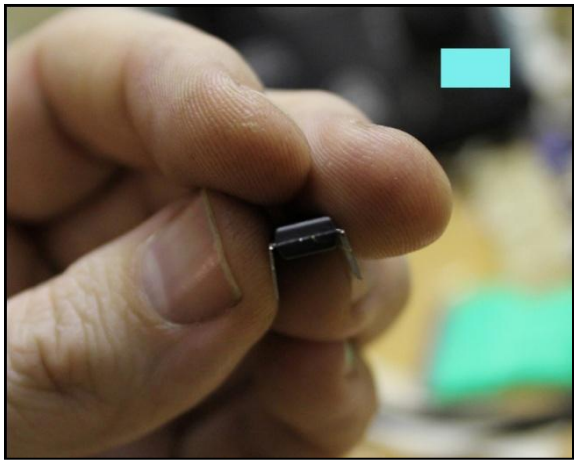


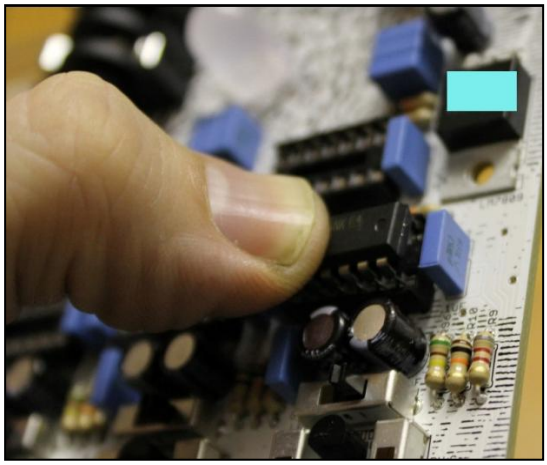


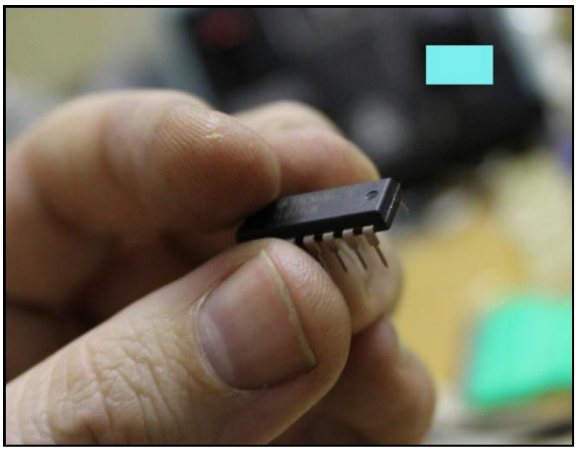
Make sure the power and audio jacks are tight against the board and well soldered. These points will receive lots of mechanical strain and will cause dramatic malfunctions if they come loose.

IC sockets





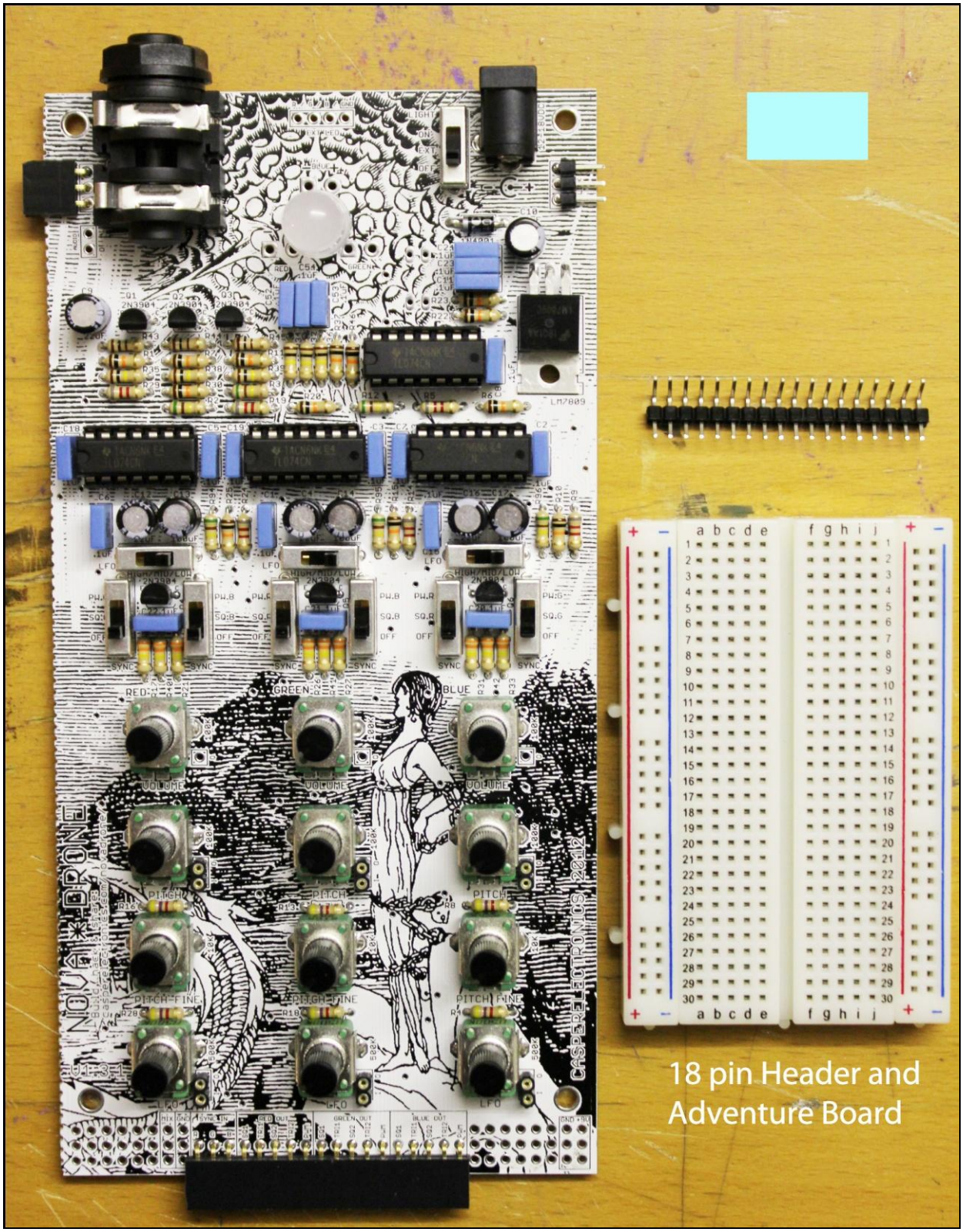


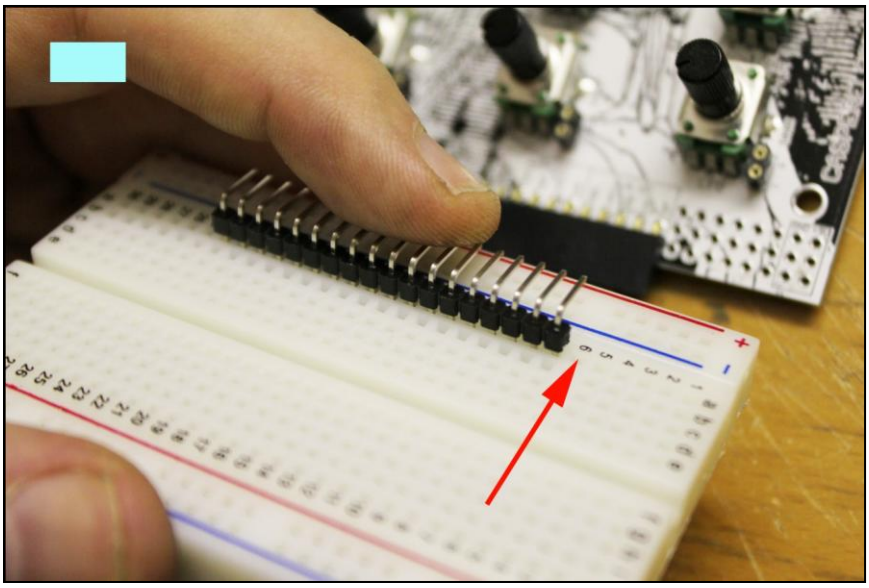


NOTE: ICs are polarized. There is a little half circle notch on one side of the IC. This should match the notch on the IC socket which in turn matches the notch drawn on the PCB. Installing the ICs can be a little tricky. The IC leads are flared out a bit wider than the socket will accept. Bend them in slightly with your fingers, and then try to press all the leads into the sockets in one shot. Check carefully to see if any of the leads have bent under between the socket and IC. If they have, don't panic, just remove with a screwdriver, carefully straighten the leads and try again. You can do it!

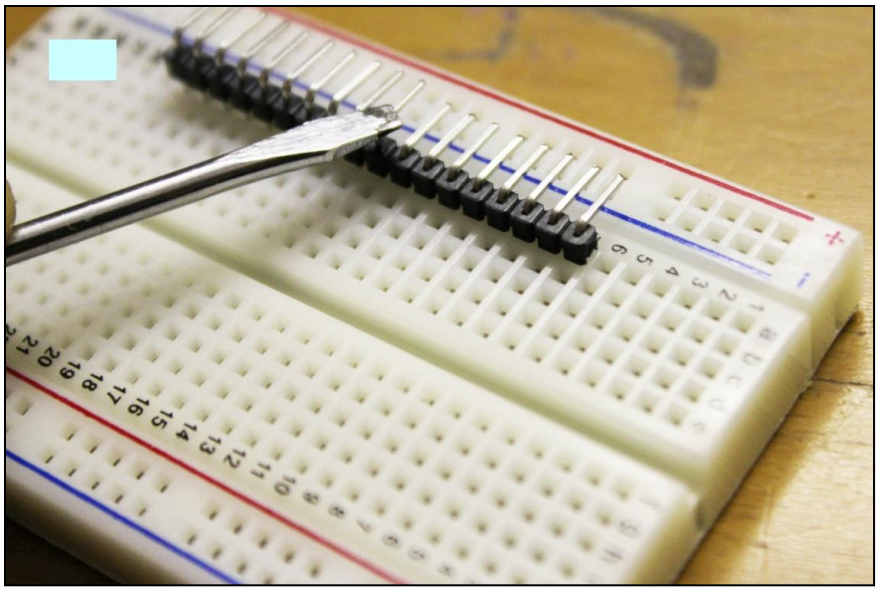
11: ADVENTURE BOARD

You're almost done! Now we will prepare the Adventure Board for installation.





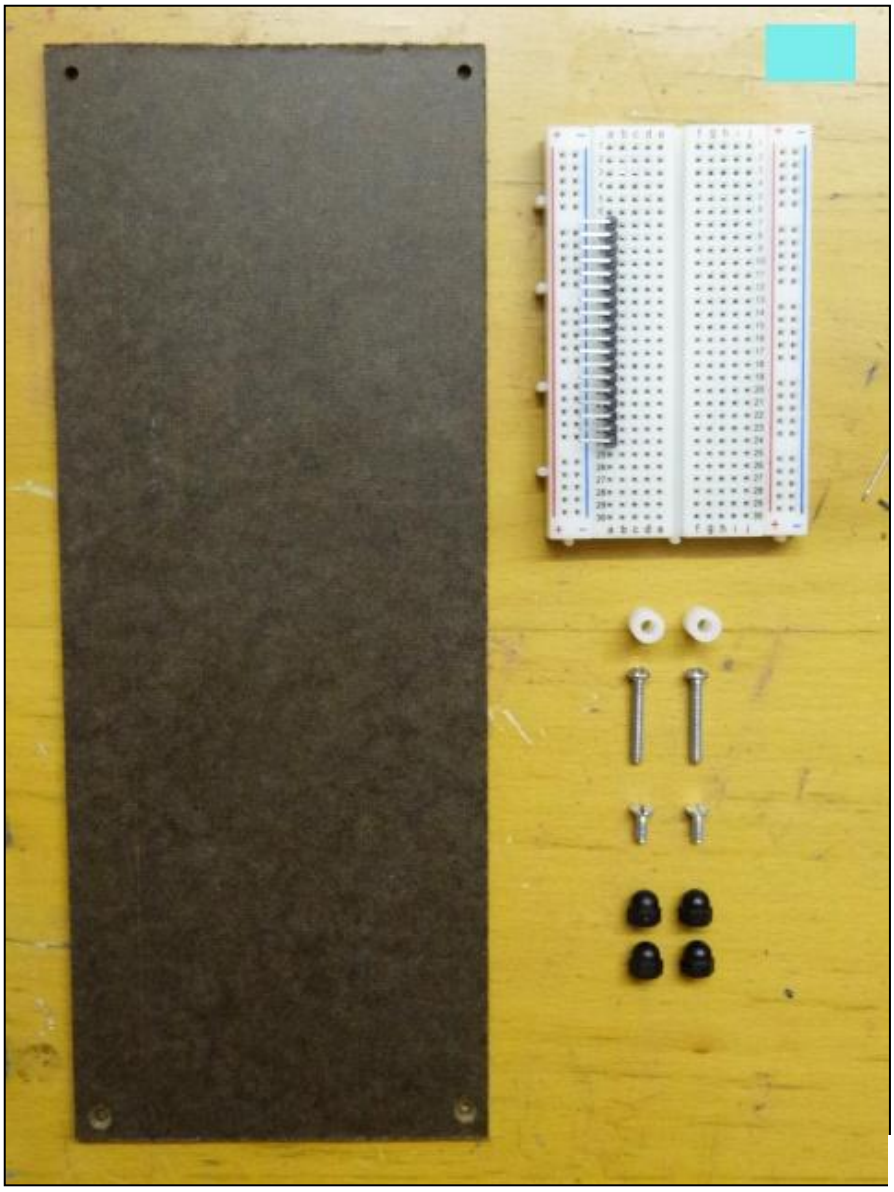
Press the Male 18 pin adventure header into the board. The right most pin of the header should plug into hole # 7 on the adventure board.

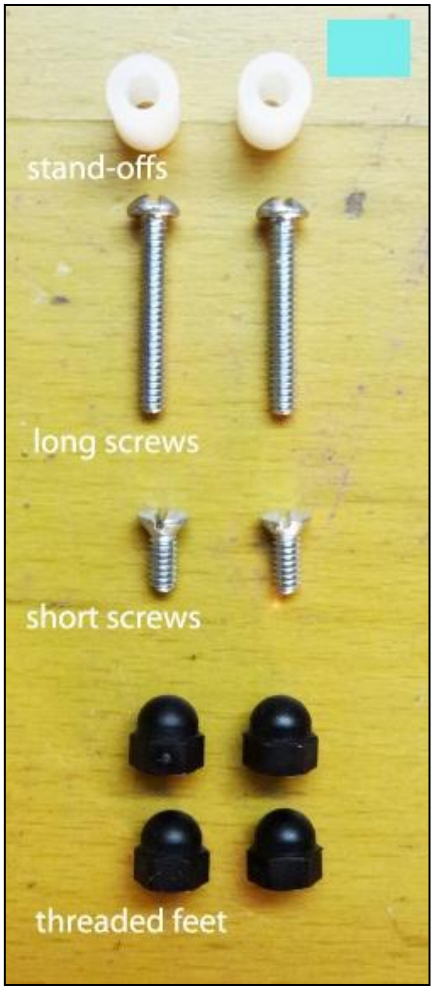


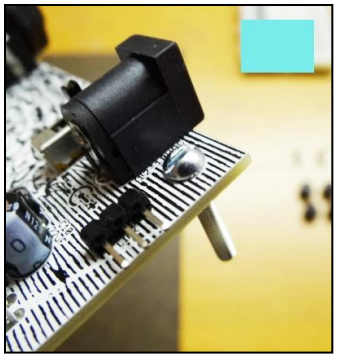
The legs of the header are just a little bit too short to sit tightly in the adventure board. In order to get a solid connection it is necessary to push the pins down one at a time as far as they will extend. Use a small flat headed screw driver or similar tool to do this.

12: Back plate

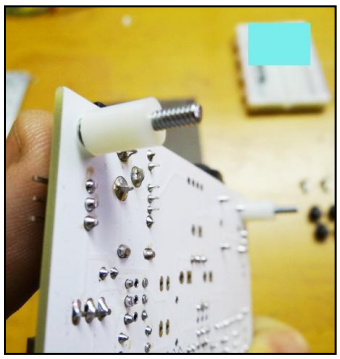
NOTE: Your kit contains a plexi glass back plate unlike the wooden one below.



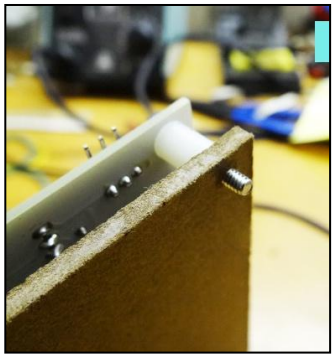




The two ¾” screws go in the back two holes of the PCB

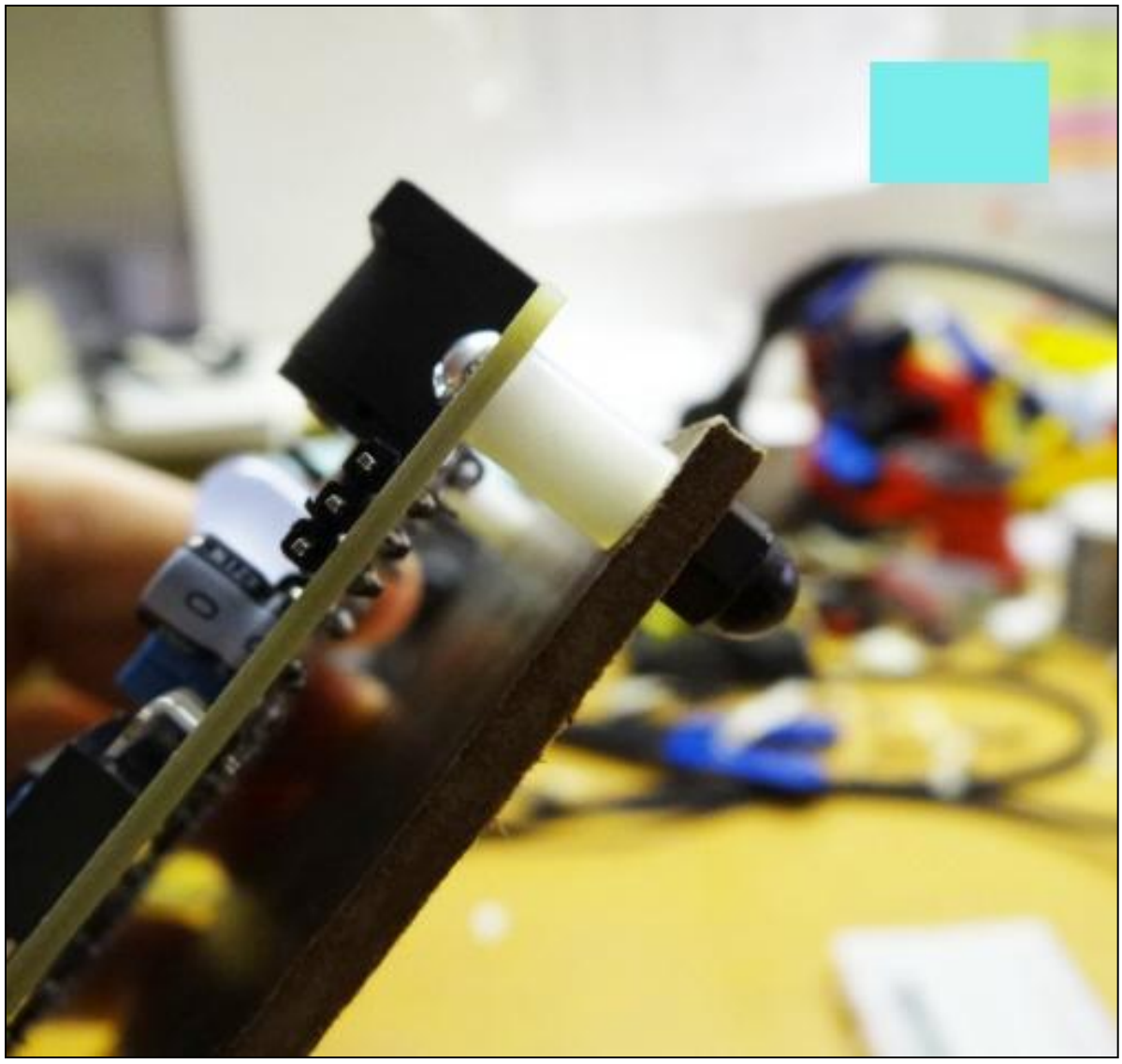


Turn the PCB over and slip the stand-offs onto the screws.



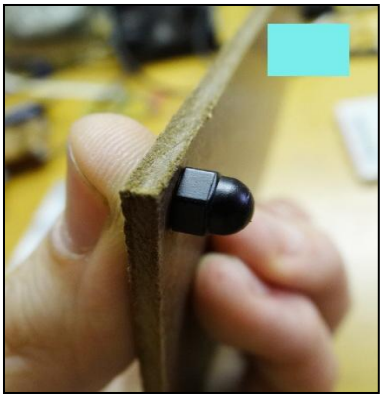
Then slip the back plate onto the screw ends.

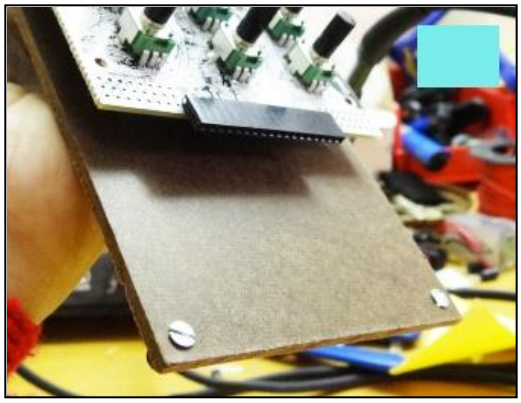
And screw on the feet

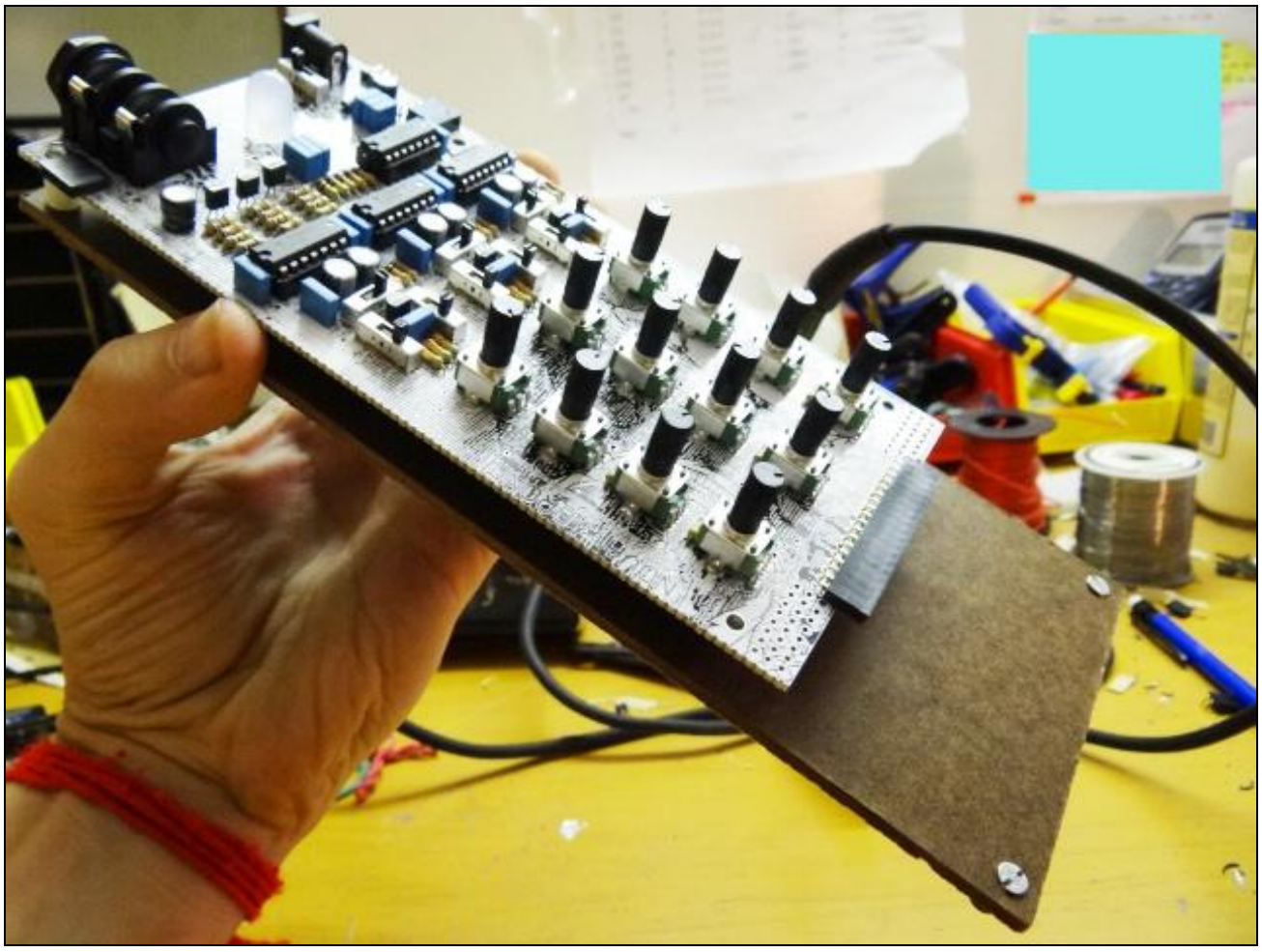


The final back foot assembly should look like this.

Install the ¼” screws and attach the 2 remaining feet.



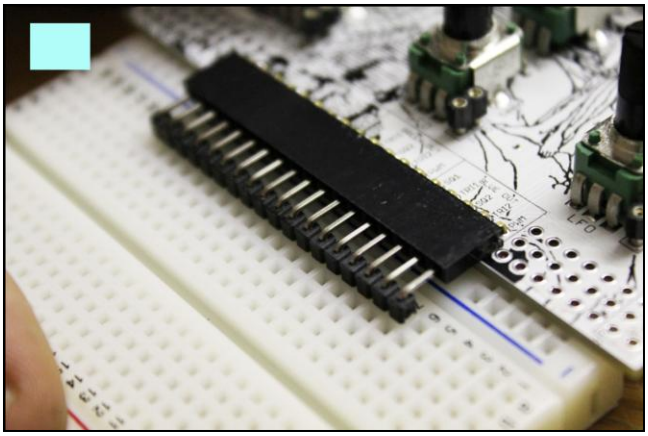




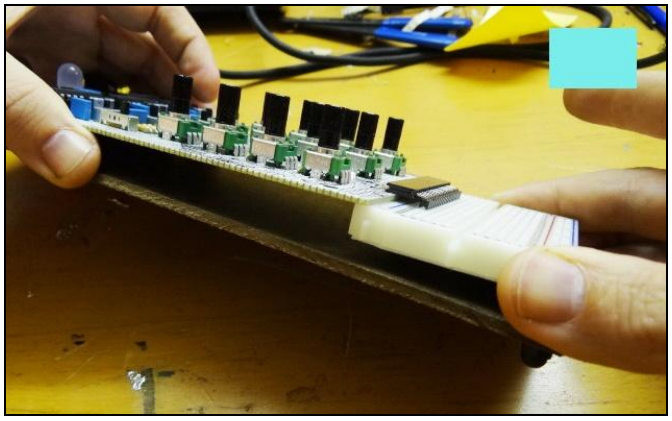
Connecting the adventure board

First, peel off the backing.

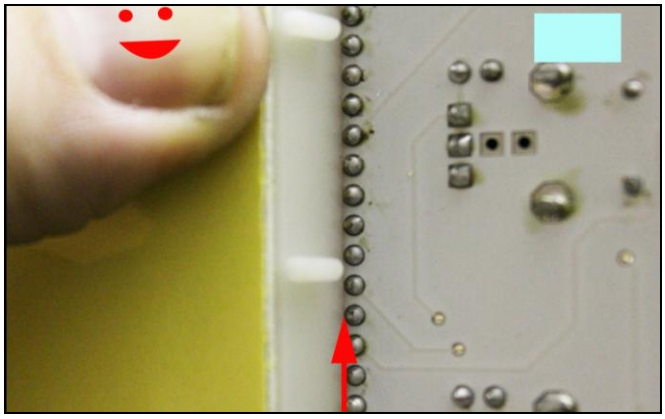
Plug the male header on the adventure board into the female header on the PCB.



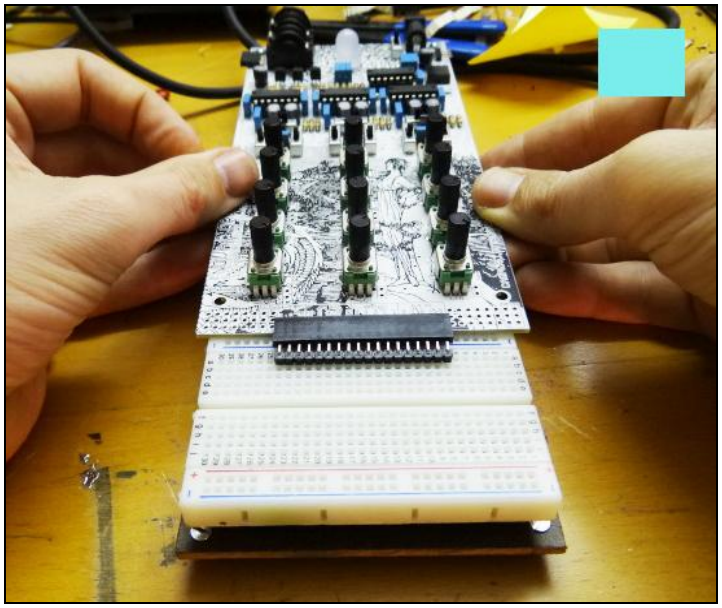
Make sure to hold the board away from the back plate.



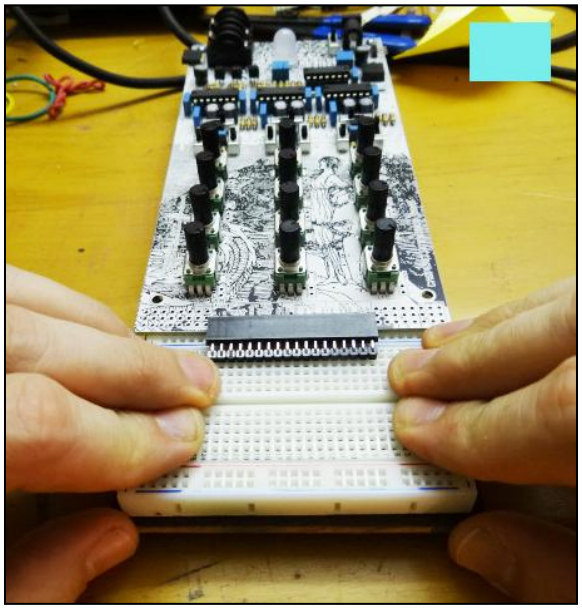
Push the edge of the board right up to the solder points on the PCB.



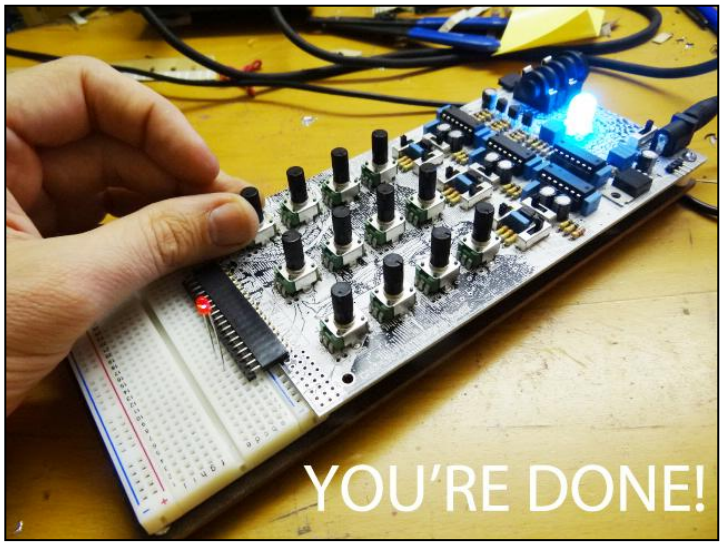
Position the board and PCB so they are centered.

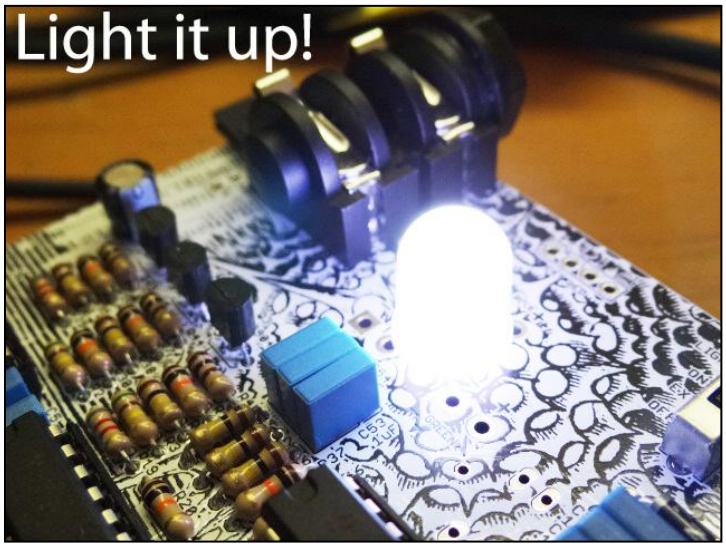


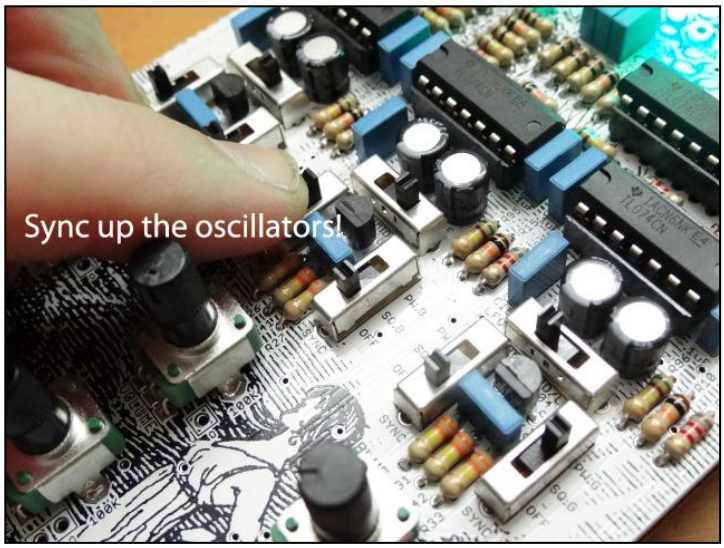
Press the adventure board firmly against the back plate.

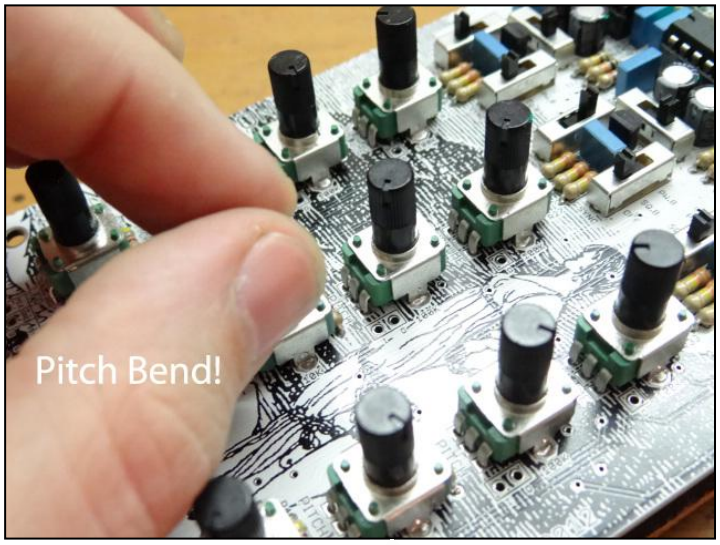


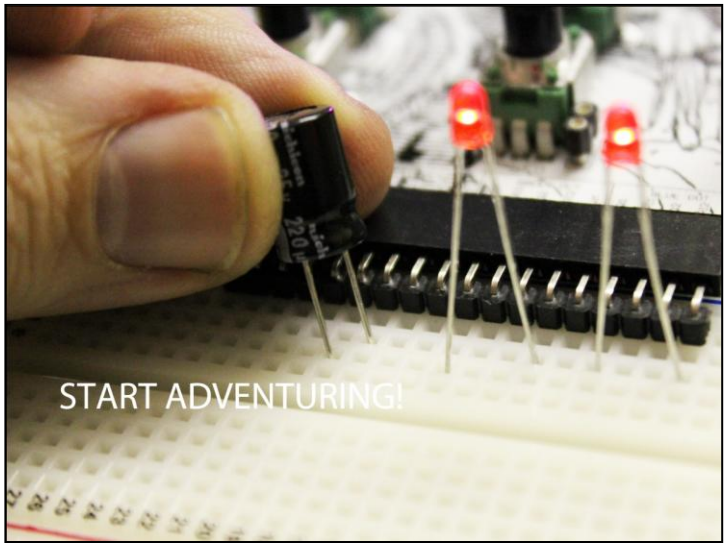
SHAZZAM!


YOU'RE DONE!


Light it up!


Sync up the oscillators!


Pitch Bend!


START ADVENTURING!

NOVA
DRONE